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ABSTRACT

This manual contains nine articles intended to assist student financial aid professionals in conducting research. Initial chapters provide basic information for those starting to do such research while later chapters deal with more complex issues. Some chapters include appendices that provide examples of the techniques under consideration. from basic information to complex issues. Chapter titles are: (1) "Doing Research and Writing About It: Suggestions for Financial Aid Administrators" (Jerry Sheehan Davis); (2) "Promoting and Conducting Campus-Based Financial Aid Research" (Harvey P. Grotrian; (3) "Compiling and Reporting Financial Aid Data" (Dallas Martin and Joseph A. Russo); (4) "Conducting Survey Research" (Arthur C. Wolfe); (5) "Models and Simulations in Financial Aid Administration and Research" (John Curtice); (6) "National Data Bases for Student Aid Researchers" (Laura Greene Knapp); (7) "Assessing the Impact of Student Financial Aid on First-Time Enrollment Decisions" (Edward P. St. John and Patricia Somers); (8) "Analyzing the Role of Financial Aid in Student Persistence" (Patricia Somers and Edward P. St. John); (9) "Enrollment Goals, Tuition Pricing, and Institutional Aid Commitments" (Nathan Dickmeyer). Contains 17 tables and 6 figures. (Individual chapters contain references.) (CH)

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Student Aid Research

A Manual for Financial Aid Administrators

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Student Aid Research

A Manual for Financial Aid Administrators

Jerry Sheehan Davis, Editor

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NASFAA is a nonprofit corporation of institutions of postsecondary education and other individuals, agencies, and students who are interested in promoting the effective administration of student financial aid in the United States.

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FOREWORD

Every time we as financial aid professionals complete a survey, provide information about programs, project amounts of funding, or identify the implications of regulatory changes, we are doing research. We may not call it that, but we are doing it.

The NASFAA Research Committee long felt the need to get a working manual on research into the hands of financial aid practitioners. We all see the effects of changes, but many of us have been hesitant to do "research" because of the mystique surrounding the word.

Allow me to boldly say that everyone who administers financial aid has at some point done research. You may have tallied up some year-end figures and provided a summary to your superior, given a presentation to your administration showing a multi-year trend of financial aid expenditures, or completed a lengthy survey detailing the various types and percentage distributions of aid at your institution. These are all forms of research and we find ourselves doing more—with less—every day.

This manual has been carefully designed to benefit both the self-proclaimed novice and the seasoned analyst. Whenever possible, a financial aid professional was selected to author the chapter in order to focus more clearly on the needs of the community. Other authors appear because of their significant contributions to our profession.

The manual begins with some basic information to help you start doing research. Later chapters deal with more complex issues facing the financial aid professional. Our intention is to meet current research needs and offer additional material to address future needs. Each chapter concludes with a list of references for further reading; some chapters include appendices that provide examples of the techniques under consideration.

Some readers might want to read the manual from front to back, and that certainly would ensure thorough coverage of the material. Those of you who are more task oriented, however, might prefer to review the table of contents and lists of figures and tables, then skim the text for projects that would be of immediate interest. In either case, do bear in mind that many of the techniques the authors discuss can be adapted for a wide variety of research projects, not just those specifically described in the chapters.

Each year NASFAA issues a request for proposals for a Sponsored Research Grant Program. The program provides funding annually for a select number of research projects dealing with financial aid issues. It is our hope that this manual will spur interest in doing research, and that more people within the profession will apply for NASFAA grants. We all benefit from the collective insight of our peers.

HARRIET L. ROJAS
February 1997

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NASFAA is grateful to the authors and editor of this manual, all of whom contributed generously of their time and expertise.

The manual was produced under the auspices of the NASFAA Research Committee. Work began under the leadership of Albert G. Hermsen, University of Michigan, who chaired the committee from 1990-91 to 1992-93. Harriet L. Rojas, University of Idaho, chaired the committee in 1994-95 and coordinated the manual development project. Tim Christensen provided staff direction.

NASFAA thanks Sallie Mae for its support of Jerry Davis in his capacity as editor. Assistance with manuscript preparation was provided by Cindy Buchanan at Sallie Mae, and Pamela Applegate and Lorraine Sobson at Cutting Edge Communications, Inc.

CHAPTER 1

Doing Research and Writing About It: Suggestions for Financial Aid Administrators

Jerry Sheehan Davis

Doing research serves an important role in the personal growth and development of financial aid administrators. Research findings increase administrators' knowledge of their programs and how they work; help them better understand the effects of their policies and practices; and change their attitudes about themselves, their jobs, and their profession. Publishing research findings adds to the collective knowledge of the financial aid community and can enhance its performance and productivity.

One reason why financial aid administrators do so little research (and publish even less) is that many believe research involves the sometimes difficult tasks of reviewing the literature, setting up formal hypotheses, assembling mass quantities of numerical data, and analyzing the data through statistical tests. Research can involve these things, but it also can be less complicated.

What is Research?

In the broadest of terms, research is the simple act of carefully observing some thing, situation or phenomenon to learn more about it and better understand it. The tools of formal research, sometimes called research methodology, merely provide guidance in some techniques of careful observation so that the observations are as accurate as possible and the derived conclusions are reasonable and valid. If one can look carefully and objectively at some phenomenon and see it as it is, one can do research.

There are many reasons for doing research—for carefully observing—but three are most important. First, research increases the knowledge, responsibility and control that aid administrators have over the many problems and activities in their offices. If they don't really know how things work, they will find it very difficult to control or be responsible for them. One of the quickest ways to drive aid administrators to distraction and despair is to make them responsible for programs, policies, and practices they don't understand. Second, research helps aid administrators understand the effects (both intended and unintended) of financial aid policies and practices. Policies and practices move programs toward their goals. But if their effects are unknown, it is impossible to modify them to reach program goals. Third, research or careful observation changes attitudes and beliefs. One learns that what was thought to be true is not, and grows from this knowledge. That research sometimes contradicts belief or assumptions is possibly one reason why relatively little research is done. No one likes to be wrong, much less prove themselves wrong. But there is nothing inherently bad about having been mistaken about something. It is not, however, okay to continue to be mistaken if careful observation can correct an error. Financial aid administrators should have the courage to do research that might prove themselves mistaken. They will be better for it, as will the administration of their programs, and programs in general.

Choosing a Research Topic

It is difficult to provide financial aid administrators with a "menu" or list of topics to study, because individual knowledge of programs and their effects is diverse, as are the major concerns at financial aid offices and campuses. There are, however, some broad categories of research topics worthy of attention.

In many cases, research done to address a particular problem or issue on a campus can be adapted as the basis of a formal research paper.

Financial aid administrators can study what they do, how they spend their time, and what effects are produced by their efforts. If an office must provide various kinds of services, such as counseling, work-study job placement, and financial aid awards, aid administrators can define and categorize these services and then count how many persons receive such services within a given time frame. The number of students receiving each service can be compared to the numbers for an earlier time period to discover trends. Is the staff serving more or fewer students? Is the staff offering more or fewer clients a specific kind of service? Is the demand for a certain service greater than the staff can meet, as evidenced by fewer numbers of awards made, fewer students counseled, or longer periods of time students must wait to be served?

Another category of research involves assessment of the effects of policies for awarding aid. For example, if the aid office had to cut the number of institutional grant awards to students, how did that affect enrollment? Did fewer students of some kind or characteristic enroll this year than last year? Did fewer students return to college this year? Did those who enrolled have to borrow more to compensate for lost grants?

A third category of research involves policy analysis. One might examine the potential effects of removing home asset values from need analysis on the family contributions of aid applicants. Will Expected Family Contributions decrease substantially? For how many students? For which kind of student? How will these changes affect financial need and, therefore, the demand for aid from the college's programs?

Regardless of what research topic is chosen, for publication purposes the topic should be relevant and important to the reading audience. Chances are, however, if a research topic has relevance for administration of financial aid programs, it will be of interest and value to other members of the financial aid community. So a report or article on the topic and findings should be written and published.

Credibility

The first thing to strive for in a research report is credibility. For research to be credible, it must be logical and rational. What is counted, compared and contrasted, and analyzed must make sense to both the observer and those who will read and evaluate the research. What was carefully observed must be important to those who will read the research report.

To be credible, research must avoid broad conclusions regarding "cause and effect" relationships. When a statistical relationship between two variables or phenomena is discovered, it is tempting to conclude that one somehow "caused" the other. It is especially tempting to reach such a conclusion when a researcher firmly believes that one *should* "cause" the other. Many phenomena are *statistically* related but that doesn't mean they are *causally* related. The relationships have to be logical and warrant assumptions about causation *and* they have to occur more frequently than they would due to mere chance.

Components of a Research Report

A research report should include an introduction, a review of the appropriate literature, a description of the methodology, a presentation of the data, and a summary. The introduction should tell readers what the research intended to examine and why this particular topic deserves attention. In articles for professional journals such as the NASFAA *Journal of Student Financial Aid* or the *Journal of Higher Education*, the introduction should briefly describe how this research supplements or complements what is already known or has already been done on the topic.

Literature reviews are necessary and helpful to research, even though they might sometimes be considered tedious. While the financial aid field seems one of overwhelming printed information, articles and reports on financial aid research are relatively few in number. Therefore, collecting sources and reviewing what is available on a particular topic is not a difficult task. One can use NASFAA's *Annotated Bibliography on Student Financial Aid* and *Journal of Student Financial Aid* for references. Another useful reference is *The Economic Value of Higher Education*, by Larry Leslie and Paul Brinkman, which provides an excellent summary of research findings on the effects of student aid on access, choice, and retention, and describes how others have studied various student aid issues. (A list of books this writer continually finds useful is offered at the end of this chapter.)

Having described the research topic and its importance, the next step is to describe the research methodology, explaining why it was appropriate to use a particular method. For example, if the research involved a survey of students, briefly describe the survey, how it was administered and to whom it was given. If data on student files were compared, describe what data elements are involved, for which students, and how comparisons were made. Did the research involve looking at the same group at two points in time? Were two or more different student groups compared? Were differences in student applicant or recipient characteristics examined?

The description of the methodology should mention which statistical tests, if any, were used and why these were appropriate. If the research involved testing hypotheses, this is where to list them. Any good research text describes the proper form for a hypothesis—statements or questions that have guided the research. They are often written in the form of "if-then" statements. For example, *if* financial aid is cut, *then* enrollments will decrease. Hypotheses tell readers what one was trying to measure; research methods tell them how it was measured.

The next step is to describe what was learned. Clearly and carefully describe what numerical data were analyzed and what was learned from the analyses. If the report is for persons with limited knowledge of statistics, do not burden them with complicated statistical formulae. Simpler is nearly always better, but it is essential if potential readers are not statistically sophisticated. Sophisticated statistical techniques might have been used to analyze the data, but it is nearly always possible to describe the findings in a manner that readers can understand.

If the research data can be illustrated, consider using graphs instead of tables. In reports to senior campus administrators or the general public, tables *and* graphs can be used to describe the same phenomenon, assuming that different readers will understand one better than the other. Two different means to describe identical phenomena generally should not be used in an article for a professional journal, but writers should use whatever works best in communicating their research findings.

The last part of the article should summarize what was concluded from all observations. Each conclusion should be supported by the data presented. Avoid the mistake of basing conclusions on information not described in the article. For an article to be credible, conclusions must be supported by data or a description of what was observed, otherwise "conclusions" become merely "assertions."

After writing the first draft of a research report, let it sit for a while. Then go back to it with a careful editor's eye. Edit for grammar, punctuation, spelling and all the other fundamentals.

Edit for style. Research journals all have particular styles. Follow them, but do not worry about matters of style until after the first draft has been completed.

Edit for length. Shorter is almost always better. Readers will be busy, so they will want to learn as much as possible in the fewest number of pages.

Edit for accuracy and completeness. Make sure all citations and references are correct. Make sure all columns and rows of data add up and that the data "track" consistently from one table to another. For example, if the same students are described in different tables, the same number of students should appear in all of the tables (or an explanation should be offered for why the numbers are different).

Edit for clarity. Polish the article's words, sentences, and phrases until they shine. Then, if at all possible, ask a colleague to read the draft for clarity and comprehension. A friendly critic of an unpublished article or undistributed report is always more helpful than an unfriendly critic of a published work. Do not be afraid of criticism. The best way to learn to write research reports—or anything else—is to write, as much and as often as possible. Be determined and be patient with the learning process. Be serious about research and careful observation.

Suggested Resources

Babbie, E.R. 1975. *The Practice of Social Research*. Belmont, CA: Wadsworth Publishing Company.

Dillman, D.A. 1978. *Mail and Telephone Surveys: The Total Design Method*. New York: John Wiley.

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CHAPTER 2

Promoting and Conducting Campus-Based Financial Aid Research

Harvey P. Grotrian

Each institution should pride itself on the role that it has chosen to play and on the special contribution that it brings to the total pattern of American higher education.

John W. Gardner

Students are the lifeblood of our educational institutions. Therefore, their enrollment in desired numbers, quality, and diversity has become central to institutional planning. Institutional mission statements typically reflect, in some way, the increasing attention which enrollment issues have commanded since the 1960s.

With approximately one-half of our nation's students receiving financial aid, campus leaders' need for information on students' dependency upon financial aid to enroll and to complete their academic programs has never been greater. Financial aid administrators can and must provide information to help institutions meet student enrollment goals. Given our first-hand knowledge of the financial obstacles students must overcome to enroll, it is increasingly vital that we provide institutional policymakers with more information.

As campus leaders realize the importance of educational financing issues, financial aid administrators are becoming much more involved in institutional planning, budget-making, and decision-making processes. For some of us, this has meant career advancement and expanded responsibilities more broadly defined as enrollment planning or management. The need to better understand the financial and personal characteristics of student aid recipients and the effects of their enrollments on the financial health of their institutions is putting aid issues more frequently on planning agendas.

However, as American Council on Education president Robert H. Atwell observed, institutional chief executives "don't know what to ask, and financial aid officers do not know what to tell them." (Atwell 1981) Financial aid administrators need to be prepared to respond when asked research-related questions. But it is also part of our role as professionals to develop aid-related research useful to our offices and institutions and bring these ideas to our colleagues and superiors. Contributing to larger institutional goals by taking this type of initiative should be professionally satisfying as well as career-enhancing.

Opportunities to provide helpful research-based information to institutional decision-makers are numerous. Yet, for most aid administrators, there are obstacles to taking advantage of these opportunities (*e.g.*, the lack of time and money to devote to research). Sometimes there is a lack of incentive to do research, other than for normal reporting, because the aid administrator is not asked. But these instances are becoming rarer and rarer. It is far better for the campus aid administrator to recognize and deal with these limitations than to acquiesce to them. We must think of the possibilities. We must promote and enlist others to join in the promotion of financial aid research that informs, stimulates thinking, underscores policy and policy development, and better enables the institution to plan.

While no single path exists for the campus aid administrator to follow, here is a sample route.

1. Get a sense of the issues on your campus. Determine the information needs others (*e.g.*, admissions, academic counseling, housing, student accounts, academic departments, school and college

administrators) have and make personal contacts to discuss these needs. This exercise need not be a time-consuming task.

2. Write short descriptions of these information needs and the various ways they might be satisfied.

3. Review the financial aid literature (the NASFAA annotated bibliographies are good starting points) to determine what information is available and might be helpful.

4. Seek the advice and counsel of colleagues at other schools regarding information that might be useful on your campus.

5. Discuss with your supervisor the information needs you have identified and any literature that might be helpful.

6. Work with your supervisor in determining how the information needs of your campus' administrative units overlap with the information needs of others. Consider how answers would assist your school's policy makers.

7. Explore the following options for conducting research:
   a. by the financial aid office (staff and/or student)
   b. graduate student research/dissertation
   c as a joint office project
   d. by the school's institutional studies/research office
   e. by a faculty member
   f. under faculty direction (*e.g.*, as a class project)
   g. vendor-assisted
   h. by some combination of the above

Examples of Financial Aid Research

Research by campus aid administrators can range from calculations made with pencil, pad, and calculator, or data pulled from mainframe systems and downloaded into report files, to information collected from student surveys. No single "tool" works best across the broad range of student aid-related research topics. However, certain types of recent aid-related research have been useful in meeting institutional and office information needs.

- *Institutional Studies Office:* the enrollment of prospective admitted resident undergraduate students by parental income

- *Joint Office Project:* the need for additional financial assistance by prospective admitted nonresident student aid recipients correlated with academic qualifications

- *Financial Aid Office, Manual and Automated:* the educational debt upon graduation of undergraduate, graduate, and professional students

- *Financial Aid Office, Survey:* a service assessment survey

- *Financial Aid Office, Vendor-Assisted*: the impact of the 1992 reauthorization of the Higher Education Act on student Pell Grant eligibility

Institutional Studies Office: By adding a question regarding parental income to a survey of admitted prospective undergraduate students, it was discovered that admitted students enrolled at very nearly the same rate across all parental income intervals (see Figure 2-1). The Financial Aid Office's role was advisory, requiring little time and requiring no direct financial support.

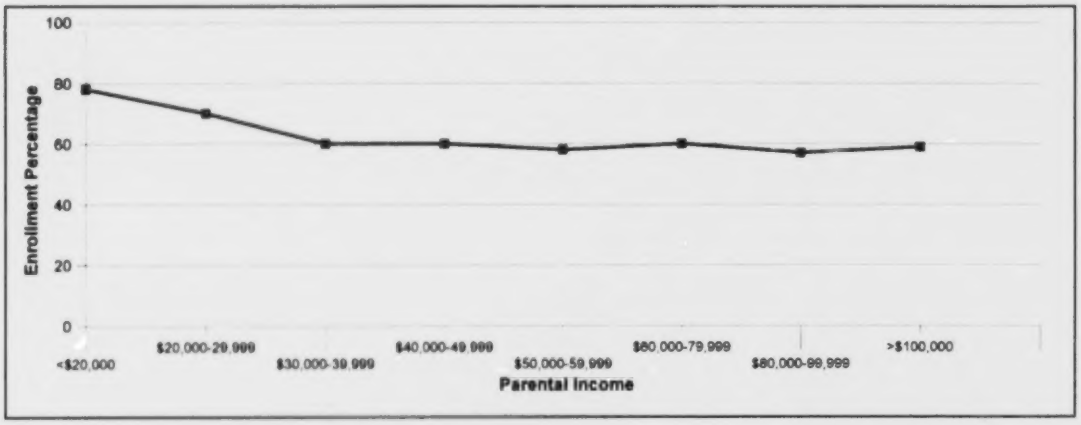

Fig. 2-1. Percentages of Admitted Freshmen Who Enrolled at the University of Michigan, by Parental Income 1992-93. (*Source*: University of Michigan Office of Academic Planning and Analysis, 1993.)

Joint Office Project: By supplying financial aid award data for nonresident non-enrolling students to the Office of Undergraduate Admissions, we learned more about student need for additional assistance (*e.g.*, parental borrowing, outside scholarship). Although this information on the large amount of remaining need was disturbing, we achieved a better understanding of the financial needs and the academic qualifications of needy admitted students who failed to enroll. Table 2-1 displays the data.

TABLE 2-1. Academic Groupings of Admitted Nonresident Undergraduate 1992-93 Prospective Students Eligible for Need-based Financial Aid and Their Unmet Financial Need

Academic Groups	Number of Students	Mean Unmet Financial Need
4.0/1300+ 31-32+	133	$5,594
3.6-4.0/1300+ 31-32+	353	$5,176
3.4-3.59/1100+ 27-28+	420	$5,187
All Other	155	$4,380

(*Source:* University of Michigan Office of Financial Aid, 1993.)

Financial Aid Office, Manual and Automated: Using available full-time staff and employing part-time help, we manually aggregated graduating students' loan data. Then the data were loaded into a report file and a set of tables prepared for borrowers by residency, ethnicity, gender, age, marital status, number of loan programs, and academic unit. Reports on graduating student debt have helped the University understand the extent to which students rely upon loans to complete their studies. The summary appears in Table 2-2.

TABLE 2-2. Student Debt Study of Degree Recipients (Total Amount Borrowed)

	Students	Average	Standard Deviation	Min.	Q25th	Q50th	Q75th	Max	Total
Undergraduate	2,106	$6,133	$3,558	$100	$3,000	$5,810	$8,500	$18,850	$12,917,373
Graduate and Professional	1,074	$11,111	$8,049	$324	$5,000	$9,601	$14,074	$46,930	$11,933,815

(*Source:* University of Michigan Office of Financial Aid, 1993.)

Financial Aid Office, Survey: Some research is of greater value to the financial aid office than to some larger institutional planning purpose. The assessment of services offered students by the financial aid office is an example. This assessment has been crucial to the office's ability to refine services, with the intent of improving their quality. It has also better enabled us to confirm or to correct—or to work at correcting—perceptions of office services held by students, staff of other offices, and the school's administration.

Periodic assessment is frequently required to maintain a satisfactory level of credibility among these constituents. Research can also be used to assess where additional resources—new or internally reallocated—are needed to improve the quality of selected service components. The results of a survey of 2,000 randomly selected students on the financial aid office data base are summarized in Appendix A.

Financial Aid Office, Vendor Assisted: Each year schools are confronted with determining how changes in the Federal Methodology will affect expected family evaluations and eligibility for aid. Table 2-3 presents the changes in Pell Grant eligibility for 1993-94 for various individual groups of students (*i.e.*, nonresident, entering). This research was accomplished by using the College Scholarship Service's Federal Methodology Simulator software and several internally developed reports. Under the University's "Equity Packaging" philosophy, each dollar of lost Pell eligibility results in a need for a replacement University Grant dollar. This estimate enabled us to more confidently assess and report on the need for additional University Grant funding for 1993-94.

TABLE 2-3. Impact of Reauthorization on Pell Eligibility For UM Students*

	Pell Eligibility Per Student CM	Pell Eligibility Per Student FM	Change in Pell Eligibility Per Student	Percentage Change
Group 1	$1,807	$1,830	$23	1%
Group 2	$1,593	$1,583	($10)	-1%
Group 3	$1,890	$1,841	($49)	-3%
Group 4	$1,638	$1,546	($92)	-6%
Group 5	$1,964	$1,977	$13	1%
Group 6	$1,692	$1,749	$57	3%
Group 7	$1,744	$1,737	($7)	0%
Group 8	$1,728	$1,618	($110)	-6%
Average	$1,757	$1,735	($22)	-1%

	Total Pell Eligibility CM	Total Pell Eligibility FM	Total Change in Pell Eligibility	Percentage Change
Group 1	$ 352,300	$ 345,800	($ 6,500)	-2%
Group 2	$ 611,850	$ 625,250	$ 13,400	2%
Group 3	$1,092,400	$1,012,650	($ 79,750)	-7%
Group 4	$2,211,250	$1,968,050	($243,200)	-11%
Group 5	$ 184,650	$ 193,750	$ 9,100	5%
Group 6	$ 219,950	$ 248,300	$ 28,350	13%
Group 7	$ 329,650	$ 321,300	($ 8,350)	-3%
Group 8	$ 413,100	$ 427,200	$ 14,100	4%
Total	$5,414,150	$5,142,300	($272,850)	-5%

* Impact of reduced Pell Eligibility on need for University gift dollars = $272,850.

(*Source:* University of Michigan Office of Financial Aid, 1993.)

When undertaking campus-based research, consider first the data already available on the characteristics of your aided population. Seek out technical advice on what you want to do and what resource "equipment" is required to gather and analyze the necessary data. Confidently promote the activity, communicating regularly with your supervisor. Be realistic in your expectations. The hour-to-hour, day-to-day demands of processing paper and delivering services to students require your attention. Accept the fact that research by aid administrators may be seen as extraneous to processing applications, making aid awards to eligible students, and providing advice and counsel to all who seek our assistance. Therefore, plan to rely upon others in the aid office and colleagues from other offices, as well as your supervisor, to support research efforts. Above all else, don't wait to be asked for research information. Be ready with the answers when the questions arise.

As campus aid administrators, we can—and must—contribute to a better understanding of our students' financial needs, the importance of student access to the financial health and mission of our schools, and the quality of the services we provide. Our schools and our students—current and future—need the benefit of our careful study and analysis of the wealth of information at our fingertips.

APPENDIX A

Executive Summary of the Report on the Office of Financial Aid 1991-1992 Assessment Survey

During the Fall and Winter Terms of 1991-92, the University of Michigan Office of Financial Aid (OFA) carried out a survey of enrolled University students on the Ann Arbor campus. The survey was seen as a useful internal tool for obtaining feedback from a random sample of students in the Financial Aid Data Base (FADB) regarding how well the OFA staff was serving the needs of its clientele, and for identifying possible areas of improvement for future operations.

The sample consisted of 2,000 students randomly selected from the 14,680 registered students in the FADB. In addition to students receiving aid through the OFA, the population included students who had applied for but had not received financial aid and students who were recorded as having received non-OFA aid (such as ROTC, athletic tenders, National Merit Scholarships, etc.) The sample was stratified on residency, grade level, and race/ethnicity in order to ensure appropriate representation of these various categories of students.

The eight-page questionnaire was mailed in late November 1991 and was followed by a reminder postcard a week later. In mid-January, a second mailing was sent to nonresponding students. A total of 961 responses were received, a satisfactory 48.1% response rate. Not surprisingly, the response rate was higher for students currently receiving aid through the OFA than for the other students.

Some of the highlights of the survey findings are listed below.

- 80% of students receiving aid reported being at least somewhat satisfied with their amount of aid; 26% were very satisfied.

- 78% of students receiving aid were at least somewhat satisfied with their combination of types of aid; 23% were very satisfied.

- 78% rated received printed information as very or fairly clear.

- 56% reported telephoning OFA during the May–August period, while 35% reported visiting OFA during that period.

- The most frequent type of contact in the fall was visiting the front counter (53%), followed by telephoning (45%), visiting the employment office (25%), visiting the payment questions desk (19%), and meeting with a counselor (11%).

- More than half the fall visitors reported average waiting times of less than 10 minutes, and 87% reported that OFA's closed times had been no problem or only a little problem for them. The longest reported waits were at the front counter, where 43% reported average waits of more than 10 minutes. (Note: The survey was carried out prior to the June 1992 physical improvements in the student reception areas and to the summer 1992 extension of hours of operation.)

- From 82% to 93% rated the various types of office contacts as at least somewhat helpful, from 26% to 50% as very helpful. In general, the more personal the contact and the longer the contact (*e.g.*, counselor appointments in contrast to telephone calls), the more helpful the respondent found it.

- From 93% to 95% rated the various types of fall contacts as at least somewhat courteous, from 35% to 64% as very courteous.

- From 81% to 93% rated the various types of fall contacts as at least somewhat knowledgeable, from 22% to 53% as very knowledgeable.

- 62% reported no difficulty or only a little difficulty getting through to the right person when telephoning OFA. The most common problems were busy signals and long holds.

- 22% indicated no problems with four aspects of financial aid paper work, despite the necessary complexity of the financial aid application process. The most frequent problem was filling out the forms.

- 85% rated the general quality of OFA service as at least satisfactory, 26% as very good. Not surprisingly, for many students, the answers to the rating questions were strongly related to their satisfaction with their aid packages. The more dissatisfied they were with their own aid, the more likely they were to downgrade OFA service in general and their specific contacts.

- 780 comments of various aspects of OFA service were written on the questionnaires. Many were quite complimentary to OFA, its staff, and its programs, but, as would be expected, some were not so positive. Overall, these comments provided many helpful suggestions for improving OFA services. All comments were transcribed in an appendix to the full report.

It is reassuring that the OFA was rated so well by its student clientele. An office whose primary task is the distribution of limited financial resources to a large number of applicants cannot be expect to satisfy all applicants completely. Demands on OFA staff are necessarily quite peaked and extremely heavy at the beginning of each term. Of course, there is always room for improvement—in printed information; in application, awarding and disbursing procedures; in tracking of documents; in personal and telephone interactions; in staff availability, etc. However, the finding that 85% of affected students rate the general quality of OFA service as satisfactory is gratifying. Survey comments are being used to improve OFA operations so that an even higher percentage of students will rate OFA service highly in a future survey of this type.

References

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CHAPTER 3

Compiling and Reporting Financial Aid Data

Dallas Martin and Joseph Russo

One of the most important financial aid administrator responsibilities involves compiling and reporting financial aid data. Doing so serves as a regular means of accounting for one's work and also provides an opportunity to review the entire operation. A sound financial aid operation will develop its policies, procedures, reports, funding, and personnel needs from a solid base of well organized data. In a nutshell, a successful operation typically reflects a solid research base.

Unfortunately, "research" is an underutilized tool. In some offices, research is feared, often because the staff has no previous experience with or training in the subject. In other cases, it simply is not deemed important enough to be considered a priority. In both situations, aid administrators may justify not doing research by saying, "I am too busy and have many other things to do that are more important." Considering the fact that student aid administration, for the most part, is a process-oriented business, it is easy to understand why individuals immersed in an overwhelming flood of paper, regulations, and students who want help "right now" often respond: "Research is something I will consider next year!" But research does not have to be the laborious theoretical type which attempts to answer all the "what if" questions that might be pondered. Rather, meaningful student aid research can be done simply by analyzing data already being compiled within the financial aid office. This analysis is often called "applied research" because it addresses the "what" and "how" questions most frequently asked by the institution's upper management. Such research is also more likely to be "descriptive" in nature.

You need not be an expert or proficient in each and every technical matter involved in research. What is important is to have a basic level of respect for the critical role that research can play in developing a financial aid program. This respect is derived from an understanding of some fundamental concepts and terms.

Using Statistics

An essential starting point in conducting research is understanding statistics. You don't have to be a mathematical wizard, but a basic understanding of statistical concepts and principles will help you compile data to permit a clear interpretation of its meaning. Simply put, statistics is the study of populations and it deals with the collection, classification, description, and interpretation of data obtained by conducting surveys and experiments. Statistics let us take the numerical properties of a particular population, or a sample of the population, and draw inferences about that population. In statistics, "population" refers to a specific group or aggregate of people. For example, all of the students who apply for financial aid at a particular institution could be one population, whereas those who are awarded financial aid might be another population or a sub-population of the first, depending on how the research is designed and on the analysis being conducted.

Statistics is a study of variation because it compares variables or differences between populations or within populations. A variable is a property, characteristic, or attribute of a person, object, or event that differs in value across such persons, objects, or events. For example, if an institution wanted to know the average summer earnings for aid applicants, it could record the earnings amount reported by each applicant, total the amounts, and divide the total by the number of applicants. In this case, the variable would be the amount of reported summer earnings. The "arithmetic mean," a statistic, is found by adding a set of measurements and dividing them by the number of measurements in the set, in this example, the

average summer earnings. If additional questions were raised about how many applicants had summer earnings greater than or less than the calculated average, then it would be necessary to apply some additional statistical techniques. *This is why it is important to anticipate what questions are likely to be asked before one begins collecting and classifying data.*

To illustrate this point, consider the following example. Mary has been asked to calculate the average state grant awarded to 52 recipients at Maplewood Community College. Table 3-1 illustrates a record sheet on which the amount of the state grant for each of the 52 recipients has been recorded.

TABLE 3-1. Record Sheet of State Grant Award Recipients

Recipient's Name	Amount Received	Recipient's Name	Amount Received
1. Carol A.	$320	27. James A.	360
2. Mary L.	270	28. Albert B.	210
3. Rudy C.	310	29. Donald P.	270
4. Alice B.	360	30. Peter V.	370
5. Theresa E.	470	31. Samuel T.	460
6. Frank P.	420	32. George C.	330
7. Vivian G.	220	33. Roger C.	170
8. Grace H.	500	34. Newton G.	350
9. Eric C.	200	35. Karl E.	300
10. Ursala J.	370	36. Juan J.	220
11. Betty D.	250	37. John B.	430
12. Karen T.	370	38. Ben K.	310
13. Susan M.	280	39. Ted B.	500
14. Jane N.	340	40. Michael T.	340
15. Dorothy P.	310	41. Herman F.	300
16. Frankie L.	210	42. Charles L.	520
17. Elizabeth H.	350	43. Patrick M.	400
18. Tony G.	590	44. William G.	420
19. Joan S.	440	45. Leonard Z.	170
20. Nancy T.	320	46. Edward K.	320
21. Judith M.	560	47. Millie T.	380
22. William F.	380	48. Jessica Y.	290
23. John D.	380	49. Henry W.	360
24. Helen T.	290	50. Oscar D.	430
25. Martha S.	240	51. Ralph A.	270
26. Doris Z.	360	52. Martin S.	390

Table 3-1 displays the award amounts which Mary collected from the students' files, but it does not give a clear picture of how much *most* students received. A slightly better way of viewing the state grant award data would be to arrange it in order from the largest award to the smallest award. You would then have a listing as shown in Table 3-2.

TABLE 3-2. Ranking of State Grant Award Amounts (Largest to Smallest)

$590	$430	$370	$340	$300	$220
560	420	370	330	290	220
520	420	360	320	290	210
500	400	360	320	280	210
500	390	360	320	270	200
470	380	360	310	270	170
460	380	350	310	270	170
440	380	350	310	250	
430	370	340	300	240	

This arrangement gives a better picture of how the awards fall, and at a glance we can see the largest award received was $590, and the smallest was $170. We also can see that students in the middle received about $350 and that roughly half the students received between $300 and $400. Still, this arrangement has too much detail for us to see the general award pattern clearly. It also is not arranged in a convenient format for use in computing, and therefore should be condensed into a more compact form.

A further step in organizing the students' state grant award data for presentation would be to prepare a "frequency distribution." A frequency distribution table would show how often each state grant award amount occurred. In our example, let us assume state grant awards are made in even ten-dollar increments. Since we have a maximum award of $590 and a minimum award of $170, a complete frequency distribution table for our example would be 43 lines in length. Table 3-3 illustrates a portion of how the frequency distribution table for our example would be arrayed.

TABLE 3-3. Frequency Distribution of State Grant Award Amounts (Ungrouped Data)

State Grant Amount	Frequency
$590	1
580	0
570	0
560	1
550	0
540	0
530	0
520	1
510	0
500	2
*	*
200	1
190	0
180	0
170	2

*The frequency and state grant amount sequence from $210 to $490 has been omitted to save space.

As can be seen, this table would still be too long, and is not a very good format for reporting our facts. There are a number of zero entries because we are using ungrouped data and some award amounts have not been received by the 52 students in our example. Therefore, to further improve her presentation, Mary grouped the award amounts together into 15 broader categories. In our example, she grouped together three adjacent award amounts so that each grouping now includes a range of three award amounts. These groupings are called "intervals." Table 3-4 shows how the state grant award data are arrayed in a frequency distribution table using the grouped data technique.

TABLE 3-4. Frequency Distribution of State Grant Awards (Grouped Data)

Award Intervals	Tallies	Frequency
$580-600	I	1
550-570	I	1
520-540	I	1
490-510	II	2
460-480	II	2
430-450	III	3
400-420	III	3
370-390	IIIIIII	7
340-360	IIIIIIII	8
310-330	IIIIIII	7
280-300	IIIII	5
250-270	IIII	4
220-240	III	3
190-210	III	3
160-180	II	2

This table is much more compact and makes a better presentation of the frequency distribution of Maplewood Community College's state grant recipients than Table 3-3 does. By using grouped data, Mary developed a table with 15 rather than 43 lines. Grouping award amounts allowed Mary to eliminate the zero entries in her new frequency distribution. This may or may not occur depending on the size of the intervals. The researcher must decide how broad to make the grouping. This decision is a compromise between losing detail and having a more convenient and compact representation. A broader interval loses detail but condenses the data into a more compact picture. Sometimes there is no need to group data into broader categories if the variables being analyzed fall within a very narrow range of values.

In our example, Mary elected to use groupings to display the data she was asked to gather. In Table 3-4 we can see there were eight students who received a state grant award in the interval of $340-$360. We do not know from looking at Table 3-4 how many students got $340, how many got $350, and how many got $360. That detail of information was sacrificed when Mary decided to use grouped data for her frequency distribution table. The reader, therefore, has to assume the three award amounts in the interval were evenly divided. It is assumed that no single award amount will occur more often than any other, and this assumption generally is sound. So the gains in compactness and convenience of presentation make up for any slight inaccuracy introduced by Mary's grouping.

In practice, if you were tabulating a set of data, deciding on the size of the interval would be the first step. You would then set up the intervals or groupings as Mary has done in the left-hand column of

Table 3-4. Each individual is then represented by a tally mark, as Mary has done in the middle column. Finally, the column headed "Frequency" is derived by counting the number of tallies in each interval. (In our example we have shown the tally marks on the chart so you can see the process. In displaying the actual table in a report, you would delete the tally column.)

Using Graphics

When presenting research, it is often helpful to translate the facts into pictorial or graphic representations, which help people comprehend the essential features of frequency distributions. They provide a geometrical image of data that enables people to think about an issue in visual terms. Sometimes they are more likely to be remembered by the reader than tabular representations.

One common type of graphic representation is called a "histogram." Figure 3-1 is a histogram of the data from Table 3-4. The award intervals are shown along the horizontal base line, and the frequency or number of cases along the vertical axis. Note that Mary made the width of each bar correspond to the exact limits of the interval and that the histogram assumes all of the cases are uniformly distributed over the whole range of the interval. She also appropriately labeled both the horizontal and vertical axes and included a concise statement of what the graph is about. This helps others better understand the mathematical picture being presented within the graph.

Figure 1: Histogram of State Grant Recipients

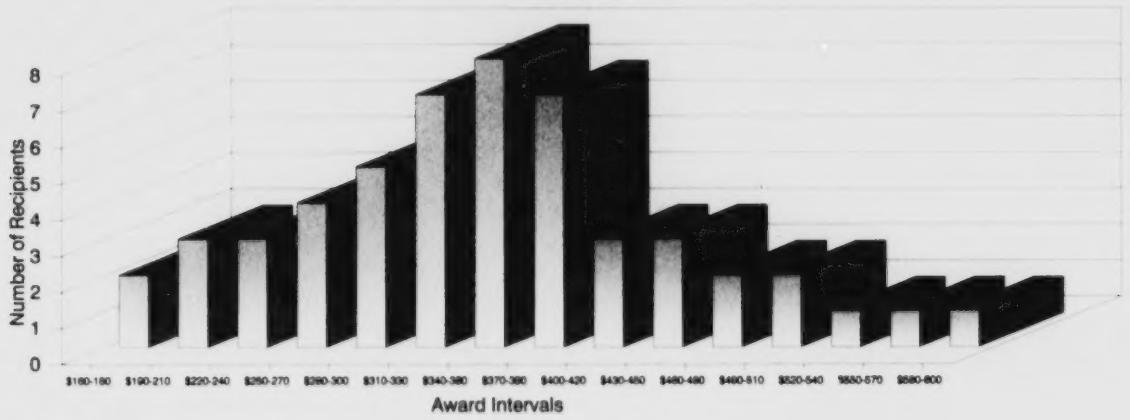

Fig. 3-1. Histogram of State Grant Recipients.

Mary might have used another type of graphic representation called a "frequency polygon." The frequency polygon assumes that all of the cases in each interval are concentrated *at the midpoint of the interval*, unlike the histogram, which assumes an even distribution. To develop a frequency polygon one simply places a dot above the midpoint of each interval at a height which corresponds to the correct frequency. Once this is done, you simply draw straight lines between the midpoints of each interval until they all are connected. Figure 3-2 illustrates a frequency polygon using the same data used in the histogram.

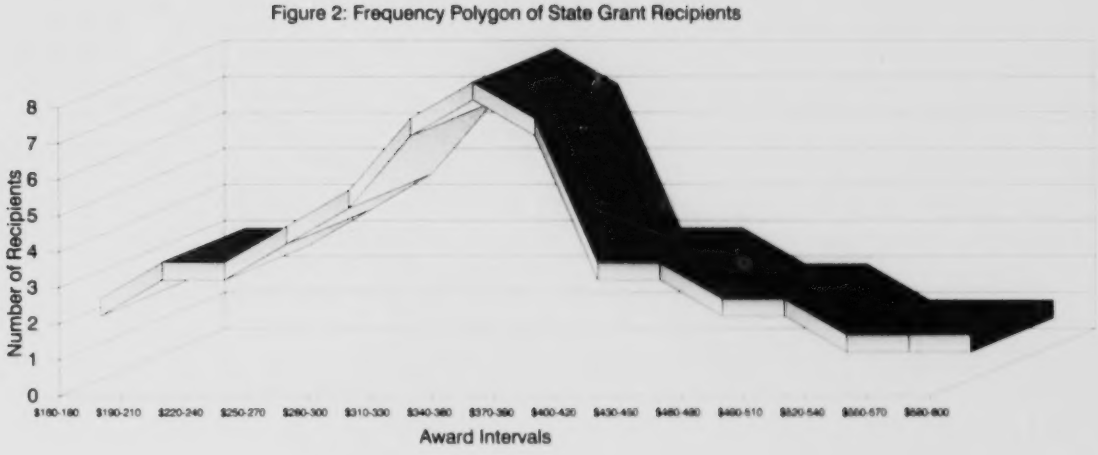

Fig. 3-2. Frequency Polygon of State Grant Recipients.

Here the histogram is probably the more effective way to display Mary's frequency distribution of state grant recipients. On the other hand, if you wanted to develop a graph to show two or more frequency distributions at the same time, then the frequency polygon would be the tool to use.

Using Measures of Central Tendency

A frequency distribution reflects how a particular variable or characteristic affects a set population. Our example, illustrated in Figure 3-1, showed that eight students received a state grant award of between $340 and $360, and that two students received an award of between $160 and $180. However, when we conduct financial aid research or respond to surveys about our aid recipients, we often are asked questions such as: "What is the typical state grant award for students at your school?" In statistics, the answer to this type of question is referred to as a measure of central tendency. The word "average" is commonly used to describe a value obtained by adding together a set of numbers and then dividing the total by the number of measurements in the set. In statistics, however, this is only one kind of average, referred to as the "arithmetic mean." In our example, if someone asked for the average (*i.e.*, arithmetic mean) of the state grants awarded to students at Maplewood Community College, you first would add together the award amounts received by all 52 students. Next, divide the total ($17,980) by 52; the "average," or arithmetic mean for this group, would be $345.80.

Another measure of central tendency is the "mode," the value or number that occurs most frequently. In Table 3-2, the award of $360 appears four times. Since it occurs more often than any other value or amount, $360 is the mode for this set of data. Examining the data reported in Table 3-2, we also see that the values of $380, $370, $320, $310, and $270 each appear three times. Therefore, if there were one less $360 award and one more $270 award, the mode would shift by $90. *The mode is sensitive to such minor changes in the data, and therefore often is not a useful indicator of the typical value.* Sometimes the mode cannot be calculated because all of the values occur with equal frequency. Thus, for the set of observations: 2, 2, 2, 5, 5, 5, 9, 9, 9, 11, 11, 11, 18, 18, and 18, no mode can be obtained since all five values occur with a frequency of three.

When two adjacent values occur more frequently than other values, the mode may be taken arbitrarily as the average of those two adjacent values. Consider the following set of numbers: 11, 11, 12, 12, 12, 13, 13, 13, 14, 14, 15, and 16. The adjacent values of 12 and 13 occur with a frequency of 3, which is greater than the frequency of remaining values. The mode of this set of numbers can be taken as 12 + 13 divided by two, or 12.5.

In statistics, a group of numbers may be referred to as "bimodal," when two nonadjacent values each occur at a greater frequency than the frequencies of adjacent intervals. In such circumstances, each of the most frequent values may be taken as a mode and the set of numbers is spoken of as bimodal. Consider the numbers: 11, 11, 12, 12, 12, 13, 13, 13, 13, 13, 14, 14, 14, 15, 15, 15, 15, 16, 16, 16, 17, 17, and 18. Here the value 13 occurs five times and is greater than the frequency of occurrence of the adjacent values; 12 and 14 each occur three times. But the value 15 occurs four times and this is also greater than the frequency of occurrence of the adjacent values. Therefore, this set of numbers may be called bimodal.

A third measure of central tendency is the "median." Simply explained, the median is the point on a scale where half of the numbers fall above it and half of the numbers fall below it. Consider the following set of seven numbers: 3, 8, 14, 19, 20, 22, and 23. In this set of numbers, which are arranged in order of magnitude, 19 would be the median since three numbers fall below it and three fall above it. If the number 25 was added to this set of numbers, then the median would be calculated as 19 + 20 divided by two, or 19.5.

When a frequency distribution is represented in graphical form, the ordinate at the median divides the total area under the curve into two equal parts. (An "ordinate" is a line connecting a point on a graph with the horizontal axis.) A comparison of the mean, median, and mode may be made when all three have been calculated for the same frequency distribution. If the frequency distribution is represented graphically, the mean is the point on the horizontal axis that corresponds to the center of gravity of the distribution. In other words, if a cutout of the distribution is made from heavy cardboard and balanced on a knife edge, *the point of balance will be the mean*. The median is a point on the horizontal axis where the ordinate divides *the total area* under the curve into two equal parts. Thus, half the area falls to the left and half the area falls to the right of the ordinate at the median. The mode is a point on the horizontal axis which corresponds to the highest point of the curve.

When a frequency distribution is symmetrical, the mean, median, and mode will coincide. When a frequency distribution is skewed, where more of the frequencies fall at either the low or high end of the variable, then these three measurements will not coincide. One must decide which is the most appropriate measurement to describe the central tendency for a set of data. In most cases, the arithmetic mean is preferred over the median or the mode and is regarded as an appropriate measure of central tendency for internal and ratio variables. Another advantage of the mean is that it is easily calculated and readily amenable to algebraic treatment.

The median is an ordinal statistic whose calculation is based on the ordinal properties of the data. If a set of numbers or observations is arranged in order, the median is the middle value. Consider the following two sets of numbers: 2, 7, 15, 20, and 21; and 10, 13, 15, 18, and 29. The median is 15 in both sets, yet the means are very different (*i.e.*, 13 and 17 respectively). Still, there are situations in which the median is preferred over the mean. This occurs when some of the values in a set of numbers appear to be atypical of the remaining numbers in the set. Consider the following set of numbers: 2, 3, 3, 4, 7, 9, 10, 11, and 86. The value 86 is very atypical of the other values in the set and it will greatly affect the calculated mean. In this case, the mean for the set would be 15, a value greater than eight of the nine numbers. The median for this set of numbers is 7. Under such circumstances, it may be better to use the median to describe the "typical" situation rather than use the mean.

The mode is a nominal statistic and represents the value with the greatest frequency. In most circumstances, it has limited practical value and cannot be used in algebraic manipulation. The mode is

rarely used with internal, ratio, and ordinal variables when means and medians can be calculated. Further, it has relatively little meaning unless the number of measurements under consideration is fairly large.

This brief overview of statistical terms and concepts is only an introduction to statistics and research methodology. It is not intended to provide everything one needs to know to conduct a comprehensive statistical study on some aspect of student financial aid. As William D. Van Dusen (1980) noted:

> The formal research training provided in graduate schools includes exposure to the elements of classical, formal research studies. These elements are appropriate and necessary in activities intended to present original contributions to the body of knowledge of a given academic discipline. But research intended for the world of action need not necessarily take such a rigorous course.

And

> Action research does not require fancy statistics, which most audiences do not really understand, and which often tend to discourage use of the reports in which they are included. Frequently, means, medians, and frequency distributions will illuminate what multivariate probit analysis may occult.

Financial aid administrators can conduct practical, needed research as part of their everyday work if they will anticipate what questions need to be answered from the mass of existing data in their offices. To help illustrate this point, let us consider some of the routine reporting tasks that are expected of the financial aid office.

Responding to Surveys

Certainly all aid administrators respond to inquiries from prospective students as well as from those who enrolled, graduated, or may have left the school. Timing and accuracy are important public relations features of these routine communiqués. But in today's world of multimedia marketing, financial aid administrators are often asked to respond to surveys from organizations and individuals outside the institution.

Responding to the growing number of surveys may be difficult. The questions are often ambiguous and subject to differing interpretations, not only by respondents, but by those who analyze the answers. Moreover, some organizations may have unknown agendas inconsistent with the institution's interests. Therefore, the first step is to decide whether to respond to a particular survey. The following set of questions might be helpful in making this decision:

- Who is the survey from?
- What is the organization's reputation and integrity?
- How broadly will the data be published?
- What other institutions are participating?
- How, if at all, will the publication be marketed?
- What are the ramifications if no response is provided?
- Are the questions clearly defined? If not, can clarity be provided? (*e.g.*, does "no-need aid" include athletic grants, staff benefits?)
- Are the responses subject to misinterpretation by the casual reader?
- Are averages and estimates acceptable?
- Are the requested numbers consistent with other surveys already compiled but perhaps with slightly different categories?

If you decide to respond, it is important that the survey be completed in a timely and responsible manner. The responses provided will reflect upon the institution and the respondent. Therefore, it is essential that each survey be handled with care and wisdom.

Each institution is organized according to its own needs and traditions, and the responsibility for responding to outside surveys is often coordinated by one office. At some schools the responsibility may fall on the public relations or institutional research office; at others it is the admissions and/or financial aid office. Regardless of who has the responsibility for completing such surveys, it is vital to provide accurate information. Good practice also suggests that copies of surveys be kept not only for consistency purposes, but also for ease of updating and comparison from year to year. Copies of surveys, particularly those to which a school responds on a regular basis, can also be reviewed to identify the kinds of data that will be requested from the financial aid office. Some of the most frequently asked-for items are:

- Percentage of students who get financial aid in freshman year
- Percentage of freshmen judged to have financial need
- Average total amount of aid awarded to freshmen
- Percentage of financial need met
- Average tuition and fees expenses
- Additional tuition and fees expenses for out-of-state or out-of-district students
- Average room and board expenses
- Average books and supplies expenses
- Average transportation allowance
- Other cost allowances
- Number of college-administered need-based scholarships and average award
- Number of college-administered non-need-based scholarships and average award
- Availability of short-term loans and average of each type of loan
- Availability of long-term loans from external funds and average size of each loan
- Availability of FSEOG funds and average size of award
- Availability of FWS funds and average amount earned
- Number of part-time jobs available on campus
- Number of part-time jobs available off campus
- Application forms required to apply for aid
- Institution's priority deadline for aid applicants, if any
- Institution's closing deadline for aid applicants, if any
- Payment plans offered by institution, if any
- Waivers offered by institution, if any
- Date by which students will be notified of aid packages
- Average amount of indebtedness for graduates
- Availability of academic need and no-need scholarships
- Availability of music/drama need and no-need scholarships
- Availability of art need and no-need scholarships
- Availability of athletic need and no-need scholarships

While this list is not inclusive of every survey item requested of the financial aid office, it illustrates the scope of data being sought. Some questions can be answered easily, but others can only be answered accurately if the institution maintains a responsive management information system, which will be discussed later in this chapter.

Compiling Data on Aid Applicants and Recipients

Another essential reporting function is compiling and maintaining data on the characteristics of students who apply for assistance and those who are selected as recipients. The need to capture this type of data is obvious to the financial aid administrator because much of it has to be reported to those providing funding. For example, each year institutions participating in one of the three federal campus-based student aid programs are required to file a Fiscal Operations Report and Application to Participate (FISAP) with the U.S. Department of Education. This report requires the institution to provide data on eligible aid applicants who are in attendance, including:

- Total number of undergraduate students
- Total number of graduate/professional students (for schools with non-traditional calendars, student enrollment data are requested on a monthly basis showing the number of continuing students and the number of new starts)
- Taxable and untaxed income of dependent undergraduates broken down for: (1) students without a baccalaureate or first professional degree; (2) students with a baccalaureate or first professional degree; and (3) students enrolled less than full-time
- Taxable and untaxed income of independent undergraduates broken down for: (1) students without baccalaureate or first professional degree; and (2) students with baccalaureate or first professional degree
- Taxable and untaxed income of independent graduate and professional students
- Students in the above income categories who have reported an "automatic zero" Expected Family Contribution
- Number of dependent undergraduate students who received Federal Perkins Loan funds, FSEOG funds, or FWS funds and the amount awarded to those students, broken down by income categories
- Number of independent undergraduate students who received funds from one or more of the aforementioned campus-based programs and the amount awarded to those students broken down by income categories
- Number of graduate or professional students who received funds from one or more of the campus-based programs and the amount awarded to those students broken down by income categories

Although this listing does not include all the information requested on the FISAP, it clearly illustrates the need to maintain a comprehensive data base on the characteristics of the school's aid applicants and recipients. Further, the FISAP is only one of several reports that most institutions file. Schools must provide student payment summary data to the Department if they participate in the Federal Pell Grant Program. Schools also file reports on loan borrowers, quarterly and annual reports on health professions loan recipients, and similar reports on nursing student loan and scholarship recipients. In most cases, an institution also will have statistical data to report to various state agencies if it receives funding from them. Similarly, private donors of student aid funds may require data on a regular basis.

Most aid administrators spend a significant amount of time and effort complying with external reporting requests. Unfortunately, most of the data gathered to complete these reports are seldom used for other purposes. In a presentation at the annual meeting of The College Board in New York, James E. Nelson suggested to aid administrators that data compiled for submission to the state or federal government are a rich source of information that can be used in preparing articles, giving speeches, or in fashioning memoranda to senior administrators (Nelson 1983). His point was that since most of the information has to be gathered anyway, why not use it for more than one purpose?

Consider the data gathered annually for the FISAP Report. Some of the Federal Work-Study data provided on the FISAP could be turned into an informational memorandum to other administrators and department heads, describing your work-study students and demonstrating how this program financially benefits the institution and provides students with positive work experiences. Aid administrators who prepare such a report every year will soon be able to provide their colleagues with historical data on how this program has changed over the years. The data can also be used to show policy makers the success of the program and who is benefiting. Institutional data maintained over several years might also be used to prepare an article for the *Journal of Student Financial Aid* entitled "The Growth of Off-Campus Federal Work-Study Expenditures at the State University." Thus, we begin to see that data collected for one purpose can be used constructively for other purposes, and that maintenance of such data can lead to the kinds of "action research" referenced above.

Preparing An Annual Report

Another reason for compiling and maintaining student aid data is to assist in preparing an annual report. The annual report is a written document describing the operation of the institution's aid office and aid programs, and illuminating the significance of both for its readers.

An annual report should incorporate a narrative review of the past year's operations as well as a statistical summary of the decisions made and dollars administered. Both are important and are best presented together in a report after the close of the year. Waiting until the year is concluded provides for reconciliation of numbers, and it affords the writer important distance from the immediacy of the moment and the ability to gain perspective.

Frame the report with the reader in mind. For whom is the report primarily written? If others are to read it, what are they most likely to read? Will an executive summary suffice for some? It will not always be in everyone's best interest or liking to be provided reports of day-to-day operations and problems, or a detailed analysis of decisions, dollars, awards, etc. On the other hand, such detail may be very appropriate for immediate supervisors or for internal office distribution.

A well-written annual report provides a basic description of the major aspects of any financial aid operation: policies, procedures, production, personnel, publications, reports, systems, funding levels, government updates, and issues. Although sometimes tempting, it generally is not wise to dwell on frustrations in an annual report. Positives should be stressed and highlights emphasized. There are usually many achievements to be noted, even in the worst of times.

A good annual report can serve several purposes, not the least of which is providing a basis for communicating with all levels of school personnel. It also can be used as a beginning point for the next year, from which plans can be developed, challenges presented, and even a vision outlined. The report should note any problems experienced, but these often can be referenced as opportunities for the coming year. The document can also serve as an excellent training tool for new employees, a basis for longitudinal and historical research, and even as a positive feature in dealing with various government and other agency reviews.

NASFAA's 1984 publication, *How To Prepare An Annual Report*, suggests the report include time-series analysis *(e.g.*, showing data for three or more years), which is essential to establishing a context for interpretation of a given year's activities. Such an analysis, for example, might be very useful in illustrating how funding for a particular program declined from previous years, thereby reducing the number of students served during the reported year. The NASFAA publication also suggests the use of cross-sectional analysis to compare and describe aid applicant or aid recipient characteristics for the current or preceding years. Such an analysis might be useful in showing how family income levels have changed. The annual report also should include data which illustrate the importance of the aid office and aid programs to the institution and its students.

The three tables that follow contain examples of the kind of information previously mentioned. Table 3-5 illustrates a time-series analysis used to show the institution's enrollment, aid applicants, and aid recipients over a five-year period.

TABLE 3-5. Enrollment, Aid Applicants, and Aid Recipients for Academic Years 1990-91 to 1994-95

	Total Enrollment	Aid Applicants	Percentage of Enrolled Students Applying for Aid	Aid Recipients	Percentage of Enrolled Students Aided	Percentage of Applicants Aided
1990-91	2,245	1,200	53.4%	936	41.7%	78.0%
1991-92	2,252	1,285	57.1%	1,031	45.8%	80.2%
1992-93	2,370	1,379	58.2%	1,121	47.3%	81.3%
1993-94	2,400	1,416	59.0%	1,167	48.6%	82.4%
1994-95	2,475*	1,582*	63.9%	1,450*	58.6%	91.7%

* Key data elements upon which this sample report is based.

The data in Table 3-5 show that while enrollments were growing during the five-year period (10.2% from 1990-91 to 1994-95), the numbers of aid applicants *and recipients* were growing by much greater rates (31.8% and 54.9%, respectively). The data also show that growing percentages of enrolled students and aid applicants are receiving aid. Therefore, it should be obvious that this school's financial aid programs are becoming increasingly important in terms of the number and proportion of students they serve.

In terms of process, creating Table 3-5 begins by obtaining total enrollment data from the registrar's office and then dividing the number of aid applicants for that year (1,200) by total enrollment (2,245) to get the percentage of enrolled students who applied for aid (53.4%). Next, tabulate the number of aid recipients (936) and divide that number by the total enrollment for 1990-91 (2,245) to arrive at the percentage of enrolled students who were aided (41.7%). Finally, divide the number of aid recipients (936) by the number of aid applicants (1,200) to find the percent of aid applicants who were aided (78.0%) By using a time-series analysis of data over a five-year period, you would be able to show that not only were a greater percentage of enrolled students applying for aid, but of those who applied, a greater percent were awarded aid.

TABLE 3-6. Family Incomes of Aid Recipients, Academic Years 1990-91 through 1994-95

Income	1990-91		1991-92		1992-93		1993-94		1994-95	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Less than $ 3,000	95	7.0	101	7.3	108	7.7	115	8.0	120	8.3
$ 3,000 to $ 5,999	110	8.1	114	8.2	119	8.5	128	8.9	132	9.1
$ 6,000 to $ 8,999	84	6.2	90	6.5	94	6.7	99	6.9	103	7.1
$ 9,000 to $11,999	87	6.4	93	6.7	97	6.9	100	7.0	103	7.1
$12,000 to $17,999	192	14.1	193	13.9	192	13.7	195	13.6	194	13.4
$18,000 to $23,999	184	13.5	184	13.3	183	13.1	185	12.9	186	12.8
$24,000 to $29,999	230	16.9	231	16.7	232	16.6	237	16.5	238	16.4
$30,000 to $35,999	112	8.2	111	8.0	111	7.9	112	7.8	112	7.7
$36,000 and Above	50	3.7	48	3.5	46	3.3	44	3.1	42	2.9
Unknown	216	15.9	220	15.9	218	15.6	220	15.3	220	15.2
Total	1,360	100.0	1,385	100.0	1,400	100.0	1,435	100.0	1,450	100.0
Approximate Mean*	$18,330		$18,070		$17,830		$17,595		$17,420	
Median*	$18,130		$17,735		$17,406		$17,092		$16,856	

* Based on students with known family incomes.

In Table 3-6, cross-sectional analysis is used to show changes in the family incomes of aid recipients between 1990-91 and 1994-95. The first step is to develop a series of income ranges, as shown in the first column. The next step is to tabulate the family incomes for all aid recipients for each year and include them under the "number" column for that year. Next, the number of aid recipients in each income interval is totaled for the year. To establish the percentage of aid recipients in each income band, we divide the number in each category by the total number of recipients. Each of the percentages could be rounded to the closest whole number to ensure that the columns add up to 100.0%. Although not shown on this table, the mean and median income levels of each year's aid recipients were calculated only on those students whose family incomes were known. In all probability, the mean and median were derived by preparing a frequency distribution, as discussed earlier in this chapter, for each year's set of data.

Table 3-7 is an example of a table that compares the retention and withdrawal rates of students who received aid and those who did not. Such a chart can be useful in explaining to the faculty and other administrators that your student aid programs are having a positive influence on student retention.

TABLE 3-7. Retention and Withdrawal of Students Eligible to Return in Fall 1994, By Receipt of Financial Aid

	All Students		Non-Recipients		Aid Recipients		Aid Recipients
	No.	Pct.	No.	Pct.	No.	Pct.	as Pct. of All
Returned, 1994	1,657	77.1%	733	66.3%	924	88.5%	55.8%
Asked to Withdraw	150	7.0%	78	7.1%	72	6.9%	48.0%
Voluntarily Withdrew	342	15.9%	294	26.6%	48	4.6	14.0%
All Students	2,149	100.0%	1,105	100.0%	1,044	100.0%	48.6%

Table 3-7 identifies two broad categories of students who might have returned to the college but failed to do so: those who were asked by the college to withdraw and those who left of their own volition. It is important to distinguish between the two groups because they have quite different reasons for their attrition. The table is also another example of cross-sectional analysis, comparing three categories of students (those who returned, those asked to withdraw, and those who voluntarily withdrew) and the number and percentage of each who received or did not receive aid.

Note that students who received aid during the 1994 spring term were much more likely to return for the 1994 fall term than were non-recipients (88.5% versus 66.3%). Thus, very little of the college's 22.9% "attrition rate" is attributable to students who received aid. Although the accompanying narrative refers to the "college's 22.9% attrition rate" and that "only 24.4% of the students who withdrew (120 of 492) were aid recipients," none of these numbers appears on Table 3-7. The aid administrator who prepared the table and narrative assumes the reader can interpret the data to understand that the "492" is the total of all students who were asked to withdraw and those who voluntarily withdrew. Similarly, "120" is the total number of aid recipients who were asked to withdraw and those who withdrew voluntarily. The institutional attrition rate of 22.9% was derived by adding the percent of all students who were asked to withdraw and the percent who voluntarily withdrew (7.0 + 15.9 = 22.9). Finally, the aid administrator divided the total number of aid recipients who withdrew (120) by 492 to get the percent who were aid recipients (24.4%).

Tables 3-5, 3-6, and 3-7 are just a sample of the data that an institution might include in its annual report and demonstrate how data can be compiled and used. However, having reviewed these sample tables, you should conclude that one does not have to use complex statistics to present meaningful information. In fact, the tables' simplicity makes them readily understandable by nearly every reader.

Collecting Data To Reflect Staffing and Operational Needs

In an era of cost cutting, downsizing, shrinking government funding, public awareness of cost, and accusations of administrative bloat, it is more critical than ever to be able to strategically substantiate claims for adequate resources. Whether the issue is staffing, program funding, space, system support, training, or professional development, there is no better basis for making a successful argument than that which is based on good, accurate, and timely data. Compiling and reporting such data may not appear as interesting or as appealing as other aspects of an aid administrator's work; however, without it, the future may be less certain.

As Donald Ryan notes: "The workload in the financial aid office fluctuates and can change more quickly than the workload in any other office in an institution. Workload increments can fluctuate as the result of a change in federal regulations or state regulations." (Ryan 1983) Aid administrators who have worked in the profession over the past ten years can recount numerous changes in federal requirements that have dramatically increased the workload of the financial aid office. Changes in refund calculation procedures, availability of unsubsidized student loans, and expanded eligibility and verification requirements are only a few of the myriad of new modifications imposed on the financial aid office in the last few years.

Unfortunately, in spite of these new responsibilities, few aid offices have received additional resources to accomplish these tasks. Today, when resources are limited at most schools and nearly everyone is seeking additional support, it is often difficult to be heard over the roar of the crowd. Good managers, however, can often elevate their requests over others by providing supporting reliable data. Most institutions have an annual budget and planning cycle during which requests for additional staff, updated equipment, and operating expenses are submitted by various offices and departments. These requests are considered and acted upon by senior administrators. Since needs almost always exceed

resources, managers who make the most compelling cases are more likely to have their requests considered over others. Many administrators and department heads are very busy and often prepare their requests by completing the required minimum standards for submission, along with a passionate narrative which they assume illuminates their plight. While this type of submission sometimes yields desired results, often it ends up being just one more in a multitude of requests. Smart managers anticipate the needs of the office well in advance of the annual budget cycle, and begin establishing the foundation for fund requests earlier in the year.

Earlier we discussed the importance of using data from required reports for other purposes. We also described how such information might be used to prepare a memorandum to inform others in the institution of what is happening with financial aid programs and who is being served. From time to time, these communications can also be used to begin building the case for additional resources for the financial aid office.

To cite an example, consider when the law was modified to authorize unsubsidized student loans. The number of students served by the financial aid office, the number of new loan applications and files processed, and the amount of loan dollars provided to enrolled students increased dramatically at most institutions. Many aid administrators failed to use these events as an opportunity to communicate that their office was serving more students and helping to bring more dollars to campus. Fewer still captured the data to show precisely how many more students received help from the financial aid office and the increase in loan funds borrowed. While some aid administrators questioned the wisdom of making unsubsidized loan funds too readily available, few denied that their office workload increased when the policy changed. Aid administrators might inform others in their institutions of the additional debt load students are assuming because of unsubsidized loans. But this also is a perfect opportunity to document the added workload without sounding self-serving. The manager who uses such opportunities throughout the year to educate senior administrators is in a much stronger position to revisit circumstances and develop additional data to substantiate office budget requests.

Remember, data can be used to help justify staffing, equipment, and operational requests. Charts and tables showing the numbers of aid applicants, applications processed, and student contacts, along with dollars awarded, illustrate the positive contributions of the aid office to the student body and to the financial health of the institution. Conducting periodic student satisfaction surveys can also help document office contributions and identify deficiencies that need to be corrected. A time-and-effort analysis showing what is involved with specific aid office tasks and functions is also useful in educating others who may not fully grasp the significance of particular requirements. Compiling such data does not mean that you have to keep detailed accounts for long periods of time. You can record data for a few days, perhaps two or three times over a span of a two-month period. The data can then be used to show "typical workloads" and "time and effort" functions. Data collected by these means can be used to support requests for additional office expenditures or staffing.

Another example of how additional staff might be justified is to consider changing the operational procedures regarding verification of student-reported data. A more rigorous review and verification of these data (beyond that minimally expected by the government regulations) might yield a lower expenditure of limited funds. If the aid administrator can document that the costs associated with the increased verification are less than the expenditure of aid dollars, and improve the integrity of aid distribution, then there is a strong likelihood that the institution will provide the resources needed to carry out this task. An emotional plea for such resources will never be as effective in making one's case as will good, hard data.

Developing a Management Information System

Thus far we have discussed some statistical concepts that can be used to help compile and report data, and we have examined how the financial aid administrator can use the data to respond to surveys and required reports. We also have identified some kinds of data to be collected and have examined their use in preparing an annual report and in developing staffing and operational requests. Our examination so far has focused mostly on how data can be used. Both recognizing how data can be used and designing processes to gather it are important. We now need to consider how to go about collecting the data we need.

Every aid office should develop a management information system to effectively carry out its responsibilities. Most institutions have some type of system already in existence. At minimum, any institution engaged in the administration of student aid has to have a business information system that enables it to maintain records, process transactions, and perform necessary accounting functions. Today, however, most institutions are developing more comprehensive systems that meet many needs. A comprehensive management information system will not only satisfy all of the institution's routine and required traditional accounting functions, but also will integrate data from throughout the institution and use the data for multiple functional purposes.

A primary benefit of such systems is that they help compile and maintain vast amounts of statistical information which can be used to improve decision making. This information also can be used by the aid administrator to conduct research, improve reports, and make better requests for resources.

These new institutional management information systems generally are based on the premise that each organizational unit within the institution is a complete system in itself. These systems are highly interrelated sub-systems and procedures that utilize internal controls, which means that specific data only have to be entered into the system once. Much of the data entered into the institutional information system is initially collected and recorded on a paper source document. However, with greater access to technology, many schools are finding more efficient ways to collect initial data. With the range of electronic services now being offered by the Department of Education, state agencies, and others, many financial aid offices have altered their operating procedures so that much of their raw data can be electronically entered into their systems.

Regardless of how data are entered, they must first be classified to be channeled properly within the system and then processed in accordance with a set plan. To be processed, data must first be arranged into specific groupings. This enables the system to summarize the data into meaningful and useful information. A good system also will enable data calculations to be performed automatically in order to assist with accounting and record-keeping functions. Statistical analysis and comparison of data sets also are easily achieved when an automated system is properly developed. Storage and retrieval tasks become routine with a well-designed management information system, and users may easily transport or reproduce data into other sub-functions so they can be used to complete any number of tasks.

A key principle to follow when accumulating data is to record the initial data into "units of the least common denominator" to permit flexibility in subsequent use. To illustrate this point, consider how income data might be entered into the management information system. The aid administrator who wants to use the system to compile family income data for the annual FISAP report is aware that the data must be arranged to fit into specific income bands. If the administrator knows that the precise income ranges requested on the FISAP form are the only way that family income data must be maintained and reported, then the system can be designed to use only those ranges for classifying and storing family income data. Thus, the FISAP income bands are the units of the least common denominator. However, if the income ranges are to be changed on next year's report, or if another report asks for family income data to be arrayed differently, the institution's system would have to be modified significantly. If the aid

administrator realized that it would be necessary at some point to report family income in intervals other than those requested on the FISAP, then the administrator could record the initial data differently and in much more detail than that required for completing the FISAP report.

When designing the management information system, it is important to bear in mind the difference between "whole dollar accounting" and "whole dollar reporting." "Whole dollar reporting" is almost universally used to prepare reports in today's environment, and it allows "cents values" to be eliminated. "Whole dollar accounting," however, is not frequently used and does not provide the kind of precision associated with financial accounting transactions. Therefore, in designing the management information system, the aid administrator is advised to seek the assistance of others within the institution who may have more experience in developing systems and who have familiarity with system principles.

The task of planning and anticipating current and future needs is well worth the time invested and will greatly assist the financial aid office in more efficiently completing required reporting tasks, maintaining higher standards of quality control, and conducting analysis and action research.

Summary

Given the multiplicity of reporting demands imposed upon the financial aid office today, it is easy to understand why one's view of the forest is often obscured by the trees. However, if financial aid staff take the time to project reporting requirements and consider how such data can be utilized for other purposes, they will discover how easy it is to produce value-added "action" research that enhances their contribution to their institutions and students. Time and effort spent on such planning is minimal when compared to the added benefits to be derived. Data compiling and reporting procedures will soon take on added importance within the aid office, yielding results that go further than simply a response to another governmental report. Data gathered can easily be converted for use in institutional planning and resource allocation. This process can identify trends and characteristics affecting students who are well served or not well served by the institution's financial aid policies and practices. It also enables the institution to evaluate whether its goals and mission are being met. A final benefit of systematically compiling, analyzing, and reporting such data is that others will increasingly rely upon the financial aid office when making their decisions, thereby elevating the stature and value of the office and its staff.

Glossary

correlation. A measure of association between two continuous variables that estimates the direction and strength of linear relationship.

data. The number of scores assigned to outcomes of variables in a given sample or population of observations.

frequency. The number of cases in a given outcome of a variable.

mean. A measure of central tendency for continuous variables calculated as the sum of all scores in a distribution divided by the number of scores; the arithmetic average or mean.

median. The value or score that exactly divides an ordered frequency distribution into equal halves; the outcome associated with the 50th percentile.

midpoint. A number exactly halfway between the true upper and lower limits of a measurement class or interval, obtained by adding the upper to the lower unit and dividing the total by two.

mode. The value of the response category in a frequency distribution that has the largest number or percentage of cases.

normal. A smooth, bell-shaped theoretical probability distribution for continuous distribution variables that can be generated from a formula.

percentile. The outcome or score below which a given percentage of observations fall.

random sample. A sample whose cases or elements are selected at random from a population.

sample. A subset of cases or elements selected from a population.

sample size. The number of cases or observations selected from a population for a specific sample.

skewed. A frequency distribution that is asymmetric with regard to its distribution dispersion.

statistic. A numerical characteristic of a population or sample.

symmetry. A property of a distribution that exhibits no skewness.

variable. A characteristic or attribute of persons, objects, or events that differs in value across such persons, objects, or events.

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CHAPTER 4

Conducting Survey Research

Arthur C. Wolfe

Using surveys in financial aid research involves collecting information from someone by asking them questions. The scope and cost of a survey effort can vary greatly. It might just be telephoning a few colleagues at peer institutions to answer a single question. Or it might involve writing to or telephoning thousands of students about their attitudes toward financial aid services or about their costs of living on or off campus.

Planning a survey involves the following interrelated issues: (1) thinking through the purpose of the survey and the feasibility of collecting the desired data at an affordable cost; (2) deciding from what population to draw the sample, how to draw it, and how large the sample should be; (3) deciding what questions to ask in what order; (4) choosing the method of data collection; (5) deciding how to organize and enter the collected data into a computer file; and (6) deciding the major purposes of the data analysis.

This chapter describes a list of eleven basic considerations in planning a survey, and then discusses the above six topics in turn. Finally, it describes some applications of the survey method and includes two examples of surveys at the University of Michigan, concerning student living costs and student assessments of financial aid services.

Some General Considerations in Survey Planning

Financial aid administrators should consider conducting a survey when they need information not already available from other sources, such as institutional data records, previous campus surveys, or external statistical or survey data collections. Planning a survey usually involves a trade-off between the ideal and the practical in terms of available funds. Some basic considerations involved in developing a survey plan are listed below.

1. To be able to generalize the survey findings to a larger population from which the sample is drawn (*e.g.*, all peer institutions, all undergraduates, all financial aid recipients, etc.), it is necessary to follow scientific procedures of random or known-probability selection of the sample.

2. To be able to generalize the survey findings to a larger population, it is necessary that a high proportion of the persons selected in the scientific sample actually provide the desired information.

3. The larger the sample size, the more reliable the survey results will be. However, the statistical precision of survey results increases in proportion to the *square root* of the sample size. This means that one needs to *quadruple* the sample size in order to *double* the precision of the survey results (*e.g.*, from a sample of 400 to a sample of 1,600).

4. Mail surveys are generally less expensive than telephone or face-to-face interviews, but it is unusual to achieve a satisfactory response rate using a single-wave (only one mailing) mail questionnaire.

5. The longer and more difficult the set of questions, the less likely that members of a sample will respond. The less the "respondent burden," the better the expected response rate, particularly in mail surveys.

6. The better a cover letter or introduction ties participation in the survey to the sample member's self-interest or desire to be of service, the more likely that he or she will respond.

7. For sensitive subjects, the more the selected respondents feel confident about the anonymity/confidentiality of their answers, the more likely that they will respond.

8. Response rates to mail questionnaires can be substantially increased by using follow-up mailings. However, this increases costs; to avoid the cost of sending follow-ups to persons who have already responded, one needs to have an identification number on the questionnaire or envelope. You can explain the purpose of this number and assure respondents that their not-anonymous answers will be treated confidentially, but this identification may reduce the willingness of some sample members to respond to the questionnaire.

9. When surveys produce unsatisfactory response rates, there is a statistical technique called post-stratification which can be used to try to make the responding sample represent the full population. For example, if men are underrepresented in the responding sample, one can give a higher weight to the male responses than to the female responses in order to achieve a male/female ratio in the sample similar to that of the population. But this technique makes the implicit assumption that the responding males are similar in their attitudes, etc., to the males who did not respond—which there is no easy way to verify. In general, to produce statistically valid and reliable generalizations from a scientifically selected sample to the larger population from which it is drawn, there is no good substitute for obtaining a high response rate (ideally at least 70%). This is because how the non-respondents might differ from the respondents on questions of interest is unknown. Therefore, it is impossible to know how different the survey findings might have been with complete responses from all of the selected sample members.

10. Even with a high response rate, the survey results will not be meaningful unless the questions are clearly understandable, unambiguous, and unbiased. The process of constructing reliable questions is an important, time-consuming, and often difficult task, which may involve one or two pretests of the questionnaire with small samples of the survey population.

11. Sometimes survey data can be of value to a financial aid administrator even if the respondents are not scientifically representative of a larger population. If an aid administrator is concerned about variations in the financial aid notification dates among competing institutions, then it may be sufficient to collect this information from a small number of the main competitors. If an aid administrator is primarily concerned with identifying problems in financial aid services as perceived by affected students, it might be sufficient to provide exit questionnaires after an office visit. One could not generalize such survey results to all financial aid recipients or even to all recipients who visit the office (unless they were carefully sampled), but the survey could still provide useful information about particular problems perceived by students. If a survey has yielded only a 20% or 30% response rate, this should be clearly noted at the beginning of a report. If there are no reasons to believe there are important differences between respondents and non-respondents, you can present the respondents' answers as interesting and probably fairly reliable while recognizing that it is

possible that the respondents do not represent the underlying population very well. Also, for some purposes it may not be necessary to generalize to a larger population.

Purpose and Feasibility of the Survey

The first step in planning a survey is to consider how the survey information would be useful and what resources can be allocated (or obtained from other institutional or external sources) for the data collection and analysis effort. Aid administrators need to decide whether the survey can be conducted entirely with current financial aid staff; whether temporary employees and/or an outside consultant (elsewhere in the institution or in a private organization) need to be added for the survey effort; whether all or part of the survey procedures should be contracted out, etc. The major factors to be considered in any survey budget, in addition to personnel, include office space, printing and duplicating, telephone and postal services, office supplies, computer services, and contracted services.

You also need to consider whether it is feasible to collect the desired information by means of a survey. For example, most financial aid administrators would like to know the degree of truthfulness of the parent asset information on their aid recipients' applications. However, this kind of sensitive information would be very difficult to obtain from a normal survey. Similarly, there are some questions regarding the validity of survey items which ask students to estimate how much they spent for books, food, recreation or some other expense category during a certain past period. Few students keep accurate records of such expenditures, and even if students tried to report expenditures accurately (which financial aid recipients might feel nervous about doing), their estimates might be too inaccurate for use in constructing student budgets. Survey research specialists have developed special techniques which can be somewhat successful at collecting sensitive information, but these special surveys are expensive.

When you are confident that a survey can collect the desired information, you need to decide what population to survey. Depending on the purposes of the survey, the desired population might include, for example, all students, all undergraduates, all minority students, all freshmen, all financial aid applicants, all financial aid recipients, all work-study students, all parents of financial aid recipients, all admittees who did not enroll, all faculty members, all financial aid staff members, all staff members of certain offices, all financial aid directors in certain types of institutions, all landlords offering housing to students, etc. It is important to think carefully about the purposes of the survey and about exactly what population is appropriate and feasible to sample.

Sampling Issues

Financial aid administrators are fortunate in that they will almost always have available a computerized list of the entire population of interest. They will seldom need to worry about the complex household listing or random digit dialing procedures used by survey organizations to obtain random samples of the general public. For example, in their own office they should be able to generate a list of all financial aid recipients. The registrar should be able to provide a list of all enrolled students with such information as class level, gender, minority status, etc., which could be used for selecting particular student groups of interest. The admissions office should be able to provide a list of students who were admitted but did not attend the institution.

Before drawing a sample of names from the population list, you need to choose the sample size based on the desired precision of the survey results and the estimated response rate. This level of precision is known popularly as the "margin of error" but is called "sampling error" or "confidence intervals" by statisticians. The margin of error defines the probable relation of a set of sample responses to the responses which would be obtained if every member of the population was surveyed. It is possible but unlikely that a distribution of answers to a question obtained from a particular sample is identical to

the true distribution of answers which would result from all members of the population answering the question. The margin of error is the range on either side of the sample percentage or mean in which the true percentage or mean is probably located. The probability level usually used by sampling statisticians is 95%. If one has a simple random sample with 400 respondents and 50% say they are very satisfied with their financial aid package, Table 4-1 below shows that there is a 5% margin of error for this finding at a 95% level of confidence. That is, you could be 95% confident that the true percentage in the population from which the sample was randomly selected is no more than 5% above or below 50%, or somewhere between 45% and 55%. If the sample size were four times as big (*i.e.*, 1,600), then the margin of error would be halved to 2.5%.

TABLE 4-1. Margin of Error (Sampling Error) by Sample Size for Five Types of Percentages, Based on Random Samples from Large Populations and a 95% Level of Confidence

Sample Size	50%	40% or 60%	30% or 70%	20% or 80%	10% or 90%
100	10.00%	9.80%	9.16%	8.00%	6.00%
200	7.08%	6.92%	6.48%	5.66%	4.24%
300	5.78%	5.66%	5.30%	4.62%	3.46%
400	5.00%	4.90%	4.58%	4.00%	3.00%
500	4.48%	4.38%	4.10%	3.58%	2.68%
750	3.66%	3.58%	3.34%	2.92%	2.20%
1,000	3.16%	3.10%	2.90%	2.52%	1.90%
1,500	2.58%	2.52%	2.36%	2.06%	1.54%
2,000	2.24%	2.20%	2.04%	1.78%	1.34%
3,000	1.82%	1.78%	1.68%	1.46%	1.10%
4,000	1.58%	1.54%	1.44%	1.26%	0.94%

The margins of error shown above are based on samples drawn from large populations where the sampling fraction, called *f* (the ratio of the sample size to the entire population), is quite small. However, many financial aid sampling fractions are likely to be relatively large, perhaps a tenth, a fifth, or even half of the eligible population. In such cases the estimated margins of error can be reduced slightly by multiplying them by a finite population correction (fpc) term, which is the square root of 1.00–*f* (*i.e.*, one minus the sampling fraction). Examples of these multipliers for some simple sampling fractions are: for *f*=1/10, 0.95; for *f*=1/8, 0.92; for *f*=1/5, 0.89; for *f*=1/4, 0.87; for *f*=1/3, 0.82; and for *f*=1/2, 0.71. If you use a 100% sample (called a census survey), there is no sampling error to worry about.

However, in addition to sampling error, you need to be concerned about non-response error or bias. The Table 4-1 margins of error for different sample sizes are based on the assumption of a 100% response rate to a questionnaire item from every member of the randomly selected sample. There are two main categories of reasons for non-response. The first is that the population list from which the sample was drawn may not be up-to-date, and some selected sample members are no longer eligible (moved away, dropped out of school, etc.). In a mail survey there will probably be some returns by the post office, but often a new address can be obtained from institutional records if the person is still an eligible respondent. Similarly in a telephone survey, if a still eligible respondent is no longer at the listed telephone number, you may be able to obtain a new number. If you find that a selected respondent is no longer eligible, it is legitimate to drop this person from the eligible sample when calculating the survey response rate.

The second, and more serious, category of non-response error for mail surveys is the sample members' failure to return the questionnaire. This may represent a conscious refusal to participate, but often it is a matter of just never getting around to it. Occasionally a mail questionnaire may be lost in the mail, but since there is usually no way to count such cases there is no way to remove them from the non-response category. In interview surveys (telephone or face-to-face), the largest category of non-response is refusal to be interviewed, but there also may be a substantial number of cases in which the selected respondent could not be contacted even with multiple callbacks.

Unfortunately, there is no simple statistical formula for estimating non-response bias. The answers to the survey questions given by respondents might be very similar to the answers that would have been given by non-respondents, in which case there would be no non-response error to worry about. On the other hand, the respondents' answers might be very different from answers given by non-respondents, leading to substantial distortion (bias) in the survey findings. For example, suppose that you only had a 50% response to a question on parental income, and that these data showed a mean annual income of $30,000. If there was a tendency for wealthier students not to participate in the survey (or to participate but to skip answering the parental income question—called "item non-response"), and if the actual mean parental income among all the non-respondents was $40,000, then the survey results showing a $30,000 mean would be biased substantially downward from the true sample mean of $35,000.

The only reliable way to adjust for non-response error is to eliminate it by obtaining a 100% response rate. Of course, few surveys are able to come close to this ideal. In the 1990s national survey organizations, such as the University of Chicago's National Opinion Research Center and the University of Michigan's Survey Research Center, have had to be content with 60-75% response rates to their telephone and face-to-face surveys. Response rates on mail surveys vary from only 10% to 90%, depending on several factors which will be discussed below.

While non-response bias will be discussed more later, the main reason for mentioning it here is that an estimate of the response rate should be used as part of the procedure for determining a desired initial sample size. For example, you might look at Table 4-1 and decide that a 5% margin of error for a 50% finding (the column with the largest margin of error and therefore the one considered desirably conservative by most statisticians) suffices for your survey purposes. Therefore you would select 400 as the appropriate initial sample size. If these persons were to be selected from a relatively small population such as 2,000 (a sampling fraction of 1/5), then you would use the finite correction factor multiplier (0.89 in this example) to reduce the desired sample size to 356. However, if you think only half your eligible respondents will answer, then you need to double the initial sample size to 712. If you suspect that about 5% of the persons on the population list may not be eligible for the survey, (*i.e.*, they have moved, have no valid address, etc.) then you should increase the initial sample size another 5% to about 748.

It should be noted that the above discussion of sample size and margin of error has to do with percentages of the entire sample. If you want the same precision of findings for some subset of the sample, such as seniors or out-of-state residents, you need to increase the total sample size accordingly. If seniors make up one-quarter of the sample and you want a minimum margin of error of 5% for percentages based just on the seniors, then you need to quadruple the size of your desired initial sample. You seldom can afford to obtain as large a sample size as you would like to have in order to obtain precise results for all subgroups of interest (*e.g.*, black males, out-of-state graduate students, in-state underrepresented minority females, etc.).

When you have a finite population list and have chosen a desired sample size, drawing a random sample is conceptually quite simple. It is like a lottery with all the names placed in an urn and thoroughly mixed and with one name at a time being drawn (without replacement) until the desired sample size is reached. There are statistical programs that can make random selections from a computerized list without going to the trouble of putting all the names in an urn. You can also assign consecutive numbers to all the

persons on the population list and then use a table of random numbers from a statistics textbook to make the desired number of selections.

Another method of drawing a random sample from a population list is "systematic random sampling." If the list is ordered randomly in respect to the survey questions of interest (for example, alphabetically), one can use the sampling fraction to select from the list. For example, if the sampling fraction was 1/15, you could use a table of random numbers to select a starting point between 1 and 15 (*e.g.*, 4) and then take every fifteenth person on the list (*e.g.*, number 4, number 19, number 34, etc.). This method can even be used with a non-integer sampling fraction, such as 1/8.9 (Kalton 1983).

Another sampling technique, "proportionate stratification," is often used to increase the precision of survey results. This involves dividing the population list into separate strata and drawing separate samples from each stratum. For example, if you want to ensure that each class level in a student survey is represented proportionately to its size, you would use the same sampling fraction with each of the separate class lists. If you used simple random sample procedures to draw from the full combined list, the resulting sample would probably represent each class fairly proportionately to its size. However, due to the random nature of the selections from a full list, it is possible that a class could be substantially underrepresented or overrepresented.

Other potential stratification variables include gender, age, race/ethnicity, residence, GPA range, marital status, etc., depending on what information is readily available about the members of the listed population, and the characteristics you suspect might be related to response differences. Strata can be based on one or a combination of variables (*e.g.*, black non-resident males, white female seniors, etc.). The more the members of a group (stratum) are like each other but unlike members of the other groups, the better it is to use stratified sampling. Gains in precision from stratifying a sample are seldom very large, but it typically does not require much additional effort, so it usually is desirable to stratify when possible.

There are computer programs which make random selections from any defined strata as long as the stratification variables are included in the computer file. You can also use stratification with systematic random sampling from a population list by first sorting the list into all the different desired strata groups and then selecting every so many cases from a random starting point throughout the entire list based on the sampling fraction.

It is also possible to use disproportionate stratification, drawing random samples using different sampling fractions within different strata. This is most common when you are interested in a particular group (*e.g.*, doctoral candidates) whose number in the total sample would be too small for meaningful analysis if you used the single sampling fraction for the whole population. The disadvantage to this technique is that the full sample is no longer a simple random sample, because each selected member does not have an equal probability of selection. This complicates analysis because all respondents cannot be treated equally. You will have to weight the responses from the different strata to calculate findings for the full sample. For example, if the sampling fraction for all but one stratum was 1/10, but the sampling fraction for a special stratum of interest was 1/5, then each respondent from the special stratum would be counted as 1/2 the value of the other respondents (using a weight of 0.5) in calculating overall survey percentages. Using unequal respondent weights makes the calculation of sampling errors much more complex; the margins of error shown in Table 4-1 are no longer appropriate. Nevertheless, the concern for obtaining sufficient data from a small stratum may justify choosing disproportionate random stratification as the most cost-effective sampling strategy.

Questionnaire Construction

One of the most difficult aspects of survey research is developing survey questions which are clear, unbiased, easily understandable, easily answered, have the same meaning to all respondents, *and* provide the information you want to know. Because the respondents selected for most financial aid surveys tend to have a relatively high level of education, questions need not always be short and simple. Still, you should try to avoid using long clauses and "big words," which increase the intellectual effort needed to respond.

Most surveys ask respondents for some demographic facts about themselves and also to answer questions about their knowledge, attitudes, beliefs, and behavior. Questions may be about actual or hypothetical situations. They may relate to something with which the respondent is very familiar, or they may relate to something the respondent knows nothing about. It is not desirable to press respondents for opinions on topics about which they feel uninformed, and you should almost always allow for a "don't know" or "can't remember" response.

Some survey questions ask respondents to fill in the blanks with numerical values (*e.g.*, dollar amounts or number of children in the family), but most common are "closed-answer" questions with the possible answers predetermined and respondents expected to choose among them. Using "open-answer" questions can provide interesting information, but open answers are very difficult to computerize and to tabulate. For example, asking the open question, "What do you think about the friendliness of the financial aid staff?" may yield interesting comments. But it might be difficult to categorize these comments to learn, for example, what percentage of students rate staff friendliness as "good." For that purpose it is much better to provide a closed question with specific answer categories such as "good," "fair," and "poor." However, open questions may be useful to learn about such things as general financial aid problems perceived by students as well as or instead of tabulations of staff ratings. Open questions may be particularly useful in a pretest or pilot study to help get a picture of what a question seems to mean to respondents and what types of closed-answer responses might be appropriate in the full-scale survey.

For some questions simple dichotomous answers (*e.g.*, yes-no) may be sufficient, but for many attitude and behavior questions it is common to include several response categories with different degree qualifiers. For example, you might ask students if they are "very likely, fairly likely, fairly unlikely, very unlikely" to do something. Or you might ask if they "strongly agree, tend to agree, tend to disagree, strongly disagree" with some statement, such as, "The financial aid staff generally is courteous." In the analysis of responses you might collapse two adjacent categories such as "strongly agree" and "tend to agree," into "agree." But sometimes it is useful to be able to distinguish between those who strongly agree and those who are more lukewarm on an issue. In general, it is desirable to include as many response categories as seem potentially useful for analysis. If the desired detailed categories are not included in the original question, there is no way to obtain such detail when you analyze the data.

Still there are problems with using various "word qualifiers," such as "very" or "somewhat" because they don't always mean the same thing to everyone. Sometimes you may want to use a numerical rating scale from 0 or 1 to 10, or 1 to 7, or 1 to 5, or even 0-100 (sometimes called a "feeling thermometer"). For example, you might use a scale from 1=abysmal to 10=wonderful, with no descriptive words attached to the numbers from 2 to 9. However, it is hard to determine if the intrinsic meaning attached to a rating of "4," for example, is any more likely to be shared by a group of respondents than the intrinsic meaning of words such as "fairly good." Sometimes a letter grading system (A to E) is used instead of numbers in the hope that these common grades have generally similar meanings to respondents.

In constructing a successful questionnaire, items should be put together so there is a logical flow between them and from one survey section to another. It is generally desirable to begin with fairly simple non-sensitive questions and to move to more difficult or sensitive questions when respondents have

become involved with the survey. It also reduces confusion and respondent burden if the same general format is used for groups of questions with few changes in instructions as one proceeds through the questionnaire.

Sometimes it is desirable to ask some questions that are contingent on the answers to previous questions. When doing this, it is useful to use arrows and boxed questions, and clear instructions, to move the respondent through the alternative sections as simply as possible. Despite the potential confusion caused by contingent questions, it generally is better to use them than to construct the questionnaire as if all questions pertain to each respondent when some clearly do not. For example, in a survey of financial aid recipients, you probably would not ask every respondent for a rating of staff friendliness; you would first ask if respondents have had any personal contact with financial aid staff and, if the answer is "no," instruct them to skip the rating question.

It is extremely important that your questions are phrased in unbiased terms. Survey researchers have opinions, and they often wish that their views were shared by others, but they always need to make their questions as objective as possible to avoid suspicion of manipulating question wording to achieve certain results.

Obviously there are different ways a particular question may be asked, and there is seldom a single "right way" to be clear and objective. It is easy to overlook ambiguous nuances of meaning or possible confusion in the "skip" instructions when developing a questionnaire, so it is always desirable to ask colleagues to review the questionnaire wording for simplicity, clarity, and objectivity. It is good to ask some outsiders to review the questionnaire, for what is clear to an insider may not always be clear to an outsider. It is essential to pretest the questionnaire with a few potential respondents to see if they find any parts unclear or biased. For major surveys, a full pilot study of the entire survey procedure may be desirable, perhaps using alternate wordings of some questions with different pilot subsamples. A pilot study can also be helpful for estimating the response rate in the full-scale survey.

Finally, you need to think about the layout of a mail questionnaire. The more it appears to be fairly short and easy to fill out, the more likely the recipient is to complete and return it. The questionnaire should appear professional, with clear easy-to-read type (either professionally printed or duplicated by a good quality copier), and it seems to help if it is printed on smaller than letter-size paper. But most important is keeping the questionnaire as short as feasible to minimize respondent burden. In almost any survey research project, you can think of many questions that would be interesting to ask. Often one of the most difficult survey research tasks is deciding which are the essential questions and weeding out less important questions to reduce respondent burden (and survey mailing and analysis costs).

Data Collection

Survey researchers utilize a variety of data collection methods, of varying costs. The face-to-face interview is the most expensive, due to personnel and travel costs. Telephone interviews are also fairly expensive because of personnel costs. Mail surveys generally are less expensive than face-to-face or telephone interviews, but they can become expensive if many follow-up mailings are necessary to boost the response rate. Survey costs can be cut if respondents come to the researcher rather than the reverse. The least expensive survey method involves distributing self-administered questionnaires to office visitors or to students in a classroom and collecting the completed questionnaires before they depart. However, this method is not likely to be satisfactory if a random sample of some general population is needed.

Sometimes the survey purpose is to discover details of respondent behavior which are difficult to recall accurately from the past. Such surveys often make use of the "prospective diary" method of data collection in which respondents are asked to keep an accurate record of some behavior for a certain future

period. The diary method is appropriate for such topics as student living costs, travel behavior, medicine-taking, nutritional intake, television viewing, general use of time, etc. Sometimes respondents are asked to maintain the diary for just one day, but more often it is for a longer period—three days, a week, a month, or even two months. It is generally more efficient to collect data from a small number of respondents over a long period of time than from a large number of respondents in a short period of time. For example, with a one-week time period you can study day-to-day variations among different individuals and not need to obtain separate random samples for each day of the week.

A long time period increases the respondent burden. Therefore, it is common to offer some incentive to diary respondents to take the trouble of keeping the desired records. Cash incentives are sometimes offered in long face-to-face interviews, and mail questionnaires sometimes include a quarter or a dollar bill or some token (such as a pen) in hope that such gifts induce respondents to complete and return the questionnaires.

The simplest and cheapest method of using a diary is to mail it to selected respondents asking that it be maintained for the desired period and mailed back. However, this simple approach is unlikely to produce a satisfactory response rate. It is better to contact potential respondents for short face-to-face interviews to distribute the diary and give instructions on its use. Respondents also can be telephoned to explain the survey and elicit cooperation; the diary then can be mailed or delivered. Often respondents are also telephoned during the diary period as a reminder and to see if they have questions about the diary procedures. At the end of the diary period, it can be mailed back or a researcher might meet with the respondent to collect the diary, check out any problems with its completion, and hand over any promised payment incentive.

When addresses are available, most face-to-face and telephone surveys use an advance letter to respondents explaining the purpose of the coming interview and seeking a positive response to an interviewer's call. With random digit dialing no advance respondent letter is possible, so interviewers have to rely entirely on their own skills to persuade respondents to participate in the survey.

With mail questionnaires there is no personal contact with the respondent, so the researcher must rely on a persuasive cover letter for cooperation. The letter (which should be on appropriate letterhead stationery) describes the purpose of the survey as favorably as possible and attempts to tie it to the recipient's self-interest or that of people like them without straining credibility. The letter should assure them that responses will be kept in confidence and be used only for general statistical analysis; it also should explain what the respondent is being asked to do. It is helpful if the letter can be signed by a relatively prestigious person and/or indicate sponsorship of the survey by prestigious organizations. You should keep the letter reasonably short so that there is not too much respondent burden just in learning about the survey request.

Except for surveying "captive" respondents in an office or classroom, the single-wave mail survey is the cheapest survey method. However, unless the cover letter is unusually persuasive or the self-interest of respondents is readily apparent (as in a survey of members of a profession about professional matters), you are unlikely to obtain more than a 25 - 50% response rate from the initial mailing. This may be sufficient for some purposes, but with such a low response rate there may be serious questions about generalizing the findings to the larger survey population.

For this reason, mail surveys frequently do follow-up mailings to non-respondents to increase the response rate. The simplest follow-up involves sending a reminder postcard or letter to all respondents about a week after the first mailing. This thanks those respondents who have already completed their questionnaires and reminds others to return the questionnaire. The reminder may also include a number to call for a second questionnaire in the event that the first one has been misplaced. Sometimes a second follow-up letter of persuasion is sent just to non-respondents about three weeks later, possibly with a second copy of the questionnaire and return envelope. If the response rate remains inadequate, a final

follow-up mailing of the letter, questionnaire, and return envelope can be sent about three weeks later, this time by certified mail to demonstrate how important their responses are to the success of the survey.

Follow-up mailings to non-respondents can only be carried out if you know which respondents returned questionnaires. You can identify respondents by including a unique code number on each questionnaire and recording which number belongs to each sample member. However, this raises questions regarding anonymity. Even with non-sensitive subjects, some respondents may dislike returning an identifiable questionnaire, so an identification number may reduce response rates even though the cover letter has promised to treat the answers confidentially. Some respondents may deface or cut off the number before returning the questionnaire. The more sensitive the subject matter, the more likely it is that anonymity will concern respondents. In sensitive cases it may be best to omit the identifying number and, if a follow-up mailing is desirable, incur the expense of sending the mailing to all of the initial sample (thanking those who have already sent a return). Identification of returned questionnaires can also be useful for matching into the survey analysis file other available data such as financial aid award or demographic information about the respondents. This reduces the amount of information to be obtained on the questionnaire (and may let you corroborate some questionnaire answers against institutional data records).

Research on mail surveys suggests that certain personalized touches help improve the response rate, such as using an inside address with the respondent's name in the salutation, hand-signing the letter in blue ink, avoiding business-type envelopes with plastic windows, typing the outside address rather than using computer labels (although this is probably not worth the extra effort), and using real stamps (perhaps commemorative) instead of postal meter or business reply marks. Studies show that not providing a postage-paid return envelope suppresses response rates, while putting a real stamp on the return envelope sometimes causes respondents to feel an obligation to complete the questionnaire and not waste the stamp (Dillman 1978).

No matter what data collection method is used there are a number of administrative tasks which must be accomplished. Interviewers and/or envelope stuffers, etc., must be hired (or reassigned from other duties), trained, supervised and paid. The sampling list needs to be obtained and the sample selected. Questionnaires need to be printed or duplicated. The cover letter needs to be duplicated on letterhead paper and signed. Envelopes need to be addressed, stuffed, stamped, and sealed. And a record-keeping system needs to be set up for keeping track of mailings, respondent contacts, questionnaire returns, etc.

Organizing the Collected Data into a Computer File

While the answers to survey questions primarily use words, computer statistical programs are designed to work primarily with numbers. So, before the collected data can be analyzed, it needs to be converted to numbers and then entered into a computer data base. This is called "coding" the data—designating different numbers as codes to represent the different answers to a question.

For most questions, this coding process is usually performed at the questionnaire construction stage. To make it easy to enter the data into a computer file directly from the questionnaires, it is customary to designate code numbers for the answers to each closed question and then print them adjacent to the answers they represent. This is called "precoding."

Most computer data bases are organized in a fixed-format rectangular structure with one line (row) of data (called a record) for each individual respondent (a case). The columns in this structure are used for the different data fields, one field (also called a variable) for each question. These fields may be one, two, or several columns wide. For example, the first field may be a three-digit case number, so it would use Columns 1-3 (entering one digit in each column). The second field might be a four-digit number for the

month and date the questionnaire was received, so it would use Columns 4-7. The third field might be a simple yes-no question using code numbers 1 and 2, so it would use just Column 8. And so forth.

A printout of a copy of this kind of data base displays long strings of seemingly meaningless numbers. Making sense of the numbers requires a codebook explaining which columns are used for each question and what answers the numbers represent. In preparing a codebook, it is customary to give each field a variable number or name and to show the complete text of each question as well as the answers and their codes. For questions with a numerical answer, such as the respondent's age, there is no need for special code numbers to represent the answers. But the variable name, the question wording, and the columns allocated to this field are still shown in the codebook. Sometimes the layout of the computer file is prepared before the questionnaire is printed and the column numbers associated with the field for each question are printed in the right margin— again to facilitate data entry.

A questionnaire may contain some open questions which can not be precoded. For example, you might ask a question like "What do you think is the most serious problem at your university these days?" You may guess in advance what the main response categories will be and put them on the questionnaire (along with room for adding other categories). But it is often better with open questions to not try to lead the respondent to reply within predefined categories. Then, when the questionnaires come in, you can read through the responses and sort them into distinct categories.

Coding responses to open questions can be a challenging process. Just when you think you have a clear and logical coding scheme, you are likely to find a response that seems to bridge two categories. So you must decide whether to attach it to one of these two categories or create a third new one. You need to be flexible in the coding process and willing to add new categories as needed, but for meaningful analysis it is usually desirable to keep the number of categories relatively small.

It used to be common to transcribe code numbers from questionnaires onto special coding forms before entering the data into the computer. Entering the data from these special forms is easier and more efficient for the keyboardist than having to turn the several pages of the questionnaire to look for the checked responses. But the time involved in such a transcription is probably more costly than the extra time required of the keyboardist, and transcription adds one more stage where errors can be made. So now the data are usually keyboarded into a computer file directly from the questionnaires. When there are open questions to be coded, this coding has to be completed and the code values written next to the questions before the computer data entry operation begins.

Available specialized computer programs simplify data entry and have features for keying in a questionnaire a second time and comparing the two records for any discrepancies (called verification). Verification is often performed on some fraction of the cases to get a rough estimate of the extent of data entry errors. Also, some general programs such as dBASE IV and EXCEL contain some data entry features. No matter what program is used, for mail questionnaires every code number in an individual record must be keyed in on the computer. Sometimes it may be desirable to contract this data entry operation to professional data entry specialists who are likely to be faster and to make fewer mistakes than less experienced keyboardists. In interview surveys, the data entry is increasingly carried out at the time of the interview through computer-assisted telephone interviewing (CATI) or by use of portable computers in face-to-face interviewing. It is sometimes feasible with self-administered questionnaires to use special answer sheets which can be read directly into the computer (like standardized test score sheets).

Data Analysis and Reporting

Once a data base file is available, the first step in the analysis of the "raw" data is to tabulate the responses using a computer statistical program. Before obtaining these tabulations, it is necessary to provide some data definition instructions, such as the names and column locations of the different

variables in the data base file. Then you can use a simple analysis command (*e.g.*, "FREQUENCIES" in SPSS) to count the number of cases for each response on each question.

These tabulations are used to check for illegitimate codes entered into the data records. You check the responses to each question against the codebook to see if there are any response values in the data records which are not in the codebook (*i.e.*, "wild" codes). For example, if you have a four-point agree-disagree question (coded 1-4) and the tabulations show two cases with the value "6," you will know there were data entry errors for these two cases. You would then need to review the questionnaires to find the correct responses, and correct the data file (called "editing").

Sometimes when you find a single wild code error you may discover that the responses to a series of questions have been entered incorrectly because the entry operator got confused about in which columns certain question responses belonged. This is called "off-punching" the data (a term that goes back to the days when data was entered by punching holes with a keypunch machine into 80-column Hollerith cards).

Of course data entries don't have to be wild to be incorrect. If the questionnaire shows that the respondent checked "2" (tend to agree) and the data record shows a "4" (strongly disagree), then the data record needs to be corrected. Without 100% verification you cannot detect and correct all such data entry errors, but you can correct the "wild codes" and find many of the off-punching errors. As part of the data cleaning process, you should also look for such things as duplicate case identification numbers and unlikely numeric values (such as an age of 14, monthly rent of $30, or a credit load of 27 hours).

The initial tabulations of the raw data provide an idea of the general results of the survey. Once you have completed the data cleaning process you should proceed to the final tabulations from the corrected data. For closed-answer questions the data are usually presented as percentages along with the base number (the *N*) from which the percentages were calculated.

Numeric answers may be presented as a mean (arithmetic average), or as a median (value of the middle case when arranged in order on the variable), or as percentiles (*e.g.*, quartiles—the 25th and 75th percentile values). Or they may be grouped into categories in ranges of values (*e.g.*, ages 18 or less, 19-20, 21-22, 23-24, 25-26, and 27-plus) and presented using percentages for each category. For many numeric variables the median may be a more meaningful measure of central tendency than the mean, because the mean can be distorted by a few large values. For example, one case of a $1,000,000 parental income would have a great effect on the mean for an income distribution, but it would have no more effect than any other case on the median. In analyzing student expense data from all students, it may be the 25th percentile value rather than the median value which is most relevant for setting "modest but adequate" student budgets.

In addition to presenting overall results from the total sample, survey reports usually feature some cross-tabulations, comparing responses from different subgroups. For example, you might look for differences in responses between males and females, or among various racial/ethnic groups, class levels, or financial aid groups (such as non-applicants, aid-denied, self-help only, grant and self-help, etc.). The variable containing the different groups being compared is called the "control" variable, and the variable whose distribution of percentages for the different response categories is displayed for each group of the control variable is called the "spread" variable.

For percentages, the margins of error at a 95% level of confidence can be roughly estimated using the appropriate sample size row from Table 4-1 (plus an fpc multiplier if appropriate). This table can be applied to percentages based on the total set of responses and also to percentages based on a subset of cases (*e.g.*, seniors or males or blacks or black males)—as long as there is no reason to doubt that the subset sample is a random one.

For judging whether the difference between two percentages is statistically significant, you can use the figures in Table 4-1 multiplied by 1.414 (the square root of 2). For example, if 50% of 400 seniors and 42% of 400 freshman rated staff friendliness as "very good," Table 4-1 indicates that the margin of

error for this difference in percentages is 7.07 (1.414 x 5.00, the margin of error for percentages near 5% with a sample size of 400 from a large population). Then you could say that statistically there is at least a 95% probability that the 8% difference between seniors and freshmen on this question represents a genuine difference between the underlying populations of seniors and freshmen from which these samples were drawn. This means that there is less than a 5% probability that this difference is a result of normal sampling variability.

Margins of error (confidence intervals) for means are often available as options in statistical programs, or they can be calculated manually from the standard deviation and standard error statistics produced by the programs. These programs also usually provide a direct test of statistical significance between two means, called a t-test. These results are often presented as a *p* value, the probability that the difference is the result of normal sampling variability. A *p* value under 0.05 is interpreted as meaning that there is at least a 95% probability that the difference in means represents a genuine difference in the underlying subgroup populations. Standard computer statistical programs rarely offer the option of producing confidence intervals and *p* values for percentages and percentage differences, but there are specialized computer programs available which can be used for this purpose.

It was noted earlier that a poor response rate from the original survey sample can call into question the sampling error and *p* value calculations. It is customary to state the obtained response rate near the beginning of a survey report and, if there is substantial non-response, to warn the reader that there may be bias in the survey findings due to possible differences between the respondents and non-respondents. It is also common to present a table comparing some distributions of known characteristics of the population with the responding sample in order to provide a visual portrayal of the "representativeness" of the responding sample.

The post-stratification technique is sometimes used in survey analysis to make a responding sample appear more like the underlying population. For example, if the underlying population is 50% male and 50% female but 60% of the respondents are female, you can weight each female respondent with the value 0.83 and each male respondent with the value 1.25 in order to make the weighted *N* for males equal to the weighted *N* for females in the overall analysis. If there are substantial differences between males and females on a variable of interest, then this technique is likely to improve the precision of the overall distribution of percentage estimates about the underlying population on that variable. But such use of differential weights substantially complicates your analysis and requires different and more complex statistical formulas to calculate sampling errors. Moreover, post-stratification can do nothing to remedy a poor response rate. There is no statistical method for estimating how different non-respondents may be from respondents on variables of interest.

As part of a survey analysis you may create some new variables (called derived variables) from the data originally entered from the survey forms. For example, the survey form may have asked for date of birth rather than age, in which case it was probably entered as a six-digit month-date-year code. Such a code is not very useful for analysis, so you need to use your statistical analysis package to compute a two-digit age variable. You might also want to "recode" this numeric age variable into a derived categorical variable of various age groups. Or you might want to collapse a four-digit agree-disagree variable into just two categories. More advanced statistical analysis might involve the development of indices or scales in which the results of several variables are counted together to create a new composite variable.

For most survey reports it is sufficient to present and discuss some tables of overall and cross-tabulated percentages or means, medians, and quartiles. Many more advanced statistical techniques, such as analysis of variance, multiple regression, and factor analysis are useful for some analyses. Displaying important results in graph form is often valuable for easier understanding and interpretation by readers. It also may be useful to transcribe answers to open questions and any comments added to the questionnaire into a narrative appendix as a means of making this information available to concerned readers.

There is no predetermined amount of analysis and reporting effort needed for a particular survey. Extensive analysis can substantially increase the time and cost of a survey project and may not be necessary to achieve the study's purpose. It is generally not necessary to report all of the tabulations you make. However, it is very important to document the survey methodology, the analysis procedures, and the main findings in a written report as fully as feasible, for future reference. It is also often useful to produce a short "executive summary" of the survey procedures and main findings.

Uses of the Survey Research Method

It is not possible to offer a definitive list of types of information which might be useful to financial aid administrators and could be collected by surveys. However, a perusal of recent and back issues of the *Journal of Student Financial Aid* provides a variety of examples. Among the survey topics reported or mentioned are: knowledge and attitudes of high school and college students and their parents about college costs and college financing; high school students' future plans; financial situations of guaranteed loan borrowers; student evaluations of financial aid services; student reports of college expenses; effect of budget cuts on financial aid programs; job satisfaction of financial aid administrators; supervisory attitudes of financial aid administrators; perceptions of financial aid administrators about nongovernmental sources of aid; comparison of need analysis policies, practices, and procedures at a selection of postsecondary institutions; and national enrollment and cost data for postsecondary institutions. Other examples include the three financial aid compensation surveys carried out among members of the Midwest Association of Student Financial Aid Administrators and the massive triennial National Postsecondary Student Aid Study of student financing and costs sponsored by the Department of Education's Office of Educational Research and Improvement.

Other relevant surveys at the University of Michigan include an enrollment decision survey of admittees who did and did not enroll; an attrition survey of students who left the University before graduation; and a survey of peer institutions regarding their various student applicant notification dates. There are many other student aid-related topics which have been researched by the survey method at institutions throughout the country.

Student Budget Surveys

A common use of the survey method involves collecting student expense data. This information is used in constructing standard student budgets for books and living expenses—usually within at least the three major housing groups of on-campus, off-campus, and in parental homes. These budgets make up an essential component of the process of awarding need-based financial aid. The NASFAA monograph *Constructing Student Expense Budgets* (April 1993) recommends carrying out such surveys periodically to try to keep these budgets "realistic and reasonable."

The monograph mentions three types of student expense surveys: (1) prospective (estimates of future expenses for a period); (2) retrospective (recall of expenses for past periods); and (3) current (using a diary to record expenditures daily for a period). Many student expense surveys have used the retrospective method, but there is considerable controversy as to whether retrospective student estimates of their expenses are accurate enough to be of much value. For example, in the 1987 National Postsecondary Student Aid Study the average reported school year expenses for food and housing from the sample of full-time full-year undergraduates were only $1,441—less than half the average of the estimates for food and housing made by their institutions ($3,003) (Korb, *et al.* 1988). There are several references to local and also statewide retrospective student expenses surveys in the *Journal of Student Financial Aid* (in Arizona, California, New York, and Wisconsin) (Stampen 1984; State University of

New York 1990). The only reference found to a diary survey was a two-month survey in 1975 at the University of California at Berkeley (Bowman 1976). However, from personal communication it was learned that a one-month diary study was conducted at University of Texas at Austin in 1976. A retrospective survey was also conducted at the University of Texas using the Student Expense Study Service of the College Entrance Examination Board. No doubt many other institutions have used this Service through the years.

At the University of Michigan, retrospective student expenses surveys were conducted by the Office of Financial Aid staff among random samples of students in 1974, 1979, 1983, 1987, and 1994. The 1994 survey was a one-wave survey (plus a reminder postcard) sent to an entire-student-body random sample of 500 students stratified on gender, race/ethnicity, class level, and in-state/out-of-state residence. The 1994 University of Michigan student expenses respondent letter, postcard, and questionnaire are included as Appendix A. The questionnaire was printed as an eight-page 7-by-8½-inch booklet.

Student Assessment of Financial Aid Services Surveys

A second but less common type of survey involves collecting data from students about their perceptions of and experiences with financial aid services and their suggestions for improving these services. These surveys have a very applied purpose, that of helping the financial aid staff evaluate their services' strengths and weaknesses and finding ways to improve them.

The first reference in the *Journal of Student Financial Aid* to this type of survey is a 1980 mailed student evaluation survey at the University of Oklahoma (Pennell and Hurst 1982). In 1983, Anton and Baker reported on two such surveys conducted at San Francisco State University, a mail survey in 1981 and a hand-out survey in 1983. In 1990 a similar mailed Student Services Survey was conducted with a sample of registered financial aid applicants at Purdue University (personal communication). More recently, NASFAA developed a Student Satisfaction Survey form to be distributed to students visiting financial aid offices at institutions participating in the first phase of the NASFAA Staffing Models Project. The first phase also included a survey of aid office staffing levels, and the second phase included an Administrator Satisfaction Survey form to be answered by six non-financial aid administrators at the institution.

A University of Michigan survey on financial aid office services was conducted in the Fall and Winter Terms of 1991-92. In late November the questionnaire was mailed to a sample of 1,996 students stratified by class level, race/ethnicity, and in-state/out-of-state residence. A week later a reminder postcard was mailed to the entire sample. Students were instructed to return the completed questionnaires through campus mail), but some added postage stamps and used the U.S. Postal Service. By the middle of January the response rate was 32.3%. Identification numbers were included on the questionnaires so that non-respondents could be identified, and a complete second mailing was made to all non-respondents. This mailing brought the final response rate to 48.1%. Copies of the survey cover letters, reminder postcard, and questionnaire (an eight-page 7-by- 8½-inch booklet) are included as Appendix B.

The University of Michigan

OFFICE OF FINANCIAL AID

2011 STUDENT ACTIVITIES BUILDING
ANN ARBOR, MICHIGAN 48109

INFORMATION

February 7, 1994

Mr. D____ B. P_____
___ Snyder Ave.
Ann Arbor, MI 48103

Dear Mr. P_____:

I am writing to ask your help. Every year the Office of Financial Aid estimates the reasonable total costs of attending the University of Michigan for use in determining eligibility for need-based financial aid awards. You have been randomly chosen to participate in a small survey of a sample of all U-M students regarding the actual costs of being a student here. We want to use this information to aid us in the construction of appropriate and realistic student cost figures.

I would very much appreciate your taking a few minutes to complete the attached student expenses questionnaire within the next 1-3 days. A stamped return envelope is enclosed.

Most of the questionnaire asks for your estimates of your expenditures for books and for various types of living expenses for certain periods. We have tried to think of all the different possible categories of expenditure which students might use, so if some category doesn't apply to you just enter "0". For most of the categories you probably do not have detailed records of actual expenditures, but I hope that with a little thought you will be able to come up with fairly accurate estimates. We would much rather have your "best guess" than a blank answer when you aren't very sure of some amount. For book costs for Winter Term some of the prices may still be on your books which can help you to report these costs fairly accurately.

Please note that this questionnaire has no identification number. The data you provide will be treated in strict confidence and will be used only for statistical analysis along with the data from the other students in the sample.

I'm sure you know that the results of a sample survey are most useful if responses are received from every person in the sample. Please respond soon. If you have any questions, you may call the OFA Research Associate, Dr. Arthur Wolfe, at 763-4119.

Thank you for assisting us in our efforts to develop realistic student cost estimates.

Sincerely,

Harvey P. Grotrian
Director

SAMPLE: Student Expenses Survey Follow-Up Postcard

Office of Financial Aid
2011 Student Activities Building
February 11, 1994

Dear Student:

Last week you should have received a University of Michigan Student Expenses questionnaire from the Office of Financial Aid. If you have already completed and returned this questionnaire, I want to **thank you very much** for your assistance to our office.

If you have not yet had an opportunity to complete your questionnaire, I would appreciate your finding time to do so **as soon as possible**. For our survey results to be most useful, we need a response from every student in the selected random sample. Thanks for your help. (If you need another copy of the questionnaire, please call Dr. Arthur Wolfe at 763-4119.)

Sincerely,

Harvey P. Grotrian
Director

UNIVERSITY OF MICHIGAN STUDENT EXPENSES SURVEY

PART A. HOUSING COSTS

1) What is your current housing situation? (*Check ONE choice below between ❶❶ and ❾❶.*)

____ ❶❶ University Dorm in a Single
____ ❶❷ University Dorm in a Double or in a Triple Suite
____ ❶❸ University Dorm in a Triple
____ ❶❹ University Dorm in an Economy Double, Economy Triple, or Converted Triple
____ ❶❾ University Dorm--Other (*explain*) _____
Dorm Name: _____

	Charges for WINTER TERM		
	Room	Board	Room&Board
____ ❷❶ Sorority or Fraternity with Board	$_____	$_____	$_____
____ ❷❷ Sorority or Fraternity without Board	$_____	(*Exclude dues here--see Part E, Q2c*)	
Sorority/Fraternity Name: _____			
____ ❸❶ Co-op with Board	$_____	$_____	$_____
____ ❸❷ Co-op without Board	$_____		
Co-op Name:_____			

Average PERSONAL MONTHLY Costs for Housing and Utilities
(including basic telephone charges but *not* long distance calls and optional services)

	Housing	Utilities	Total
____ ❹❶ University Apartment	$_____	$_____	$_____
____ ❽❶ Private Apartment	$_____	$_____	$_____
____ ❽❷ Private House	$_____	$_____	$_____
____ ❽❸ Private Room with Cooking Facilities	$_____	$_____	$_____
____ ❽❹ Private Room without Cooking Facilities	$_____	$_____	$_____

---

2) **If** you live in a private housing situation or in a University apartment, is it furnished or unfurnished?
____ ❶ Furnished
____ ❷ Unfurnished
____ ❽ Not applicable

3) With whom do you share your living quarters?
____ ❶ No one else
____ ❷ One or more non-related roommates/housemates ----------→ 3a. How many? _____
____ ❸ My spouse
____ ❹ My spouse and children ---------→ 3b. What are the children's ages? _____
____ ❺ My parent(s) and/or other relatives ----------→ 3c. How many? _____

4) **If** you live in some housing situation not covered in Q1-Q3, please explain it and give your estimated **average MONTHLY** costs for housing and utilities.

$_____

HOUSING COSTS CONT.

5) About how much did you personally spend during **FALL TERM** and during **JANUARY** for **furnishings** (including repairs) for your living quarters--furniture, TV, microwave, refrigerator, lamps, carpets, bedding, wall decorations, window coverings, cooking and eating equipment, etc. (not counting items from home)? Fall: $_____ Jan.: $_____

6) About how much do you personally spend **IN AN AVERAGE MONTH** for **household supplies** (*not food*) to use in your living quarters--soap, toilet paper, cleaning supplies, light bulbs, etc.?
$_____

. . . . . .

PART B. FOOD AND BEVERAGE COSTS

1) Are you paying for an **Entree Meal Plan** during **WINTER TERM**?

____ ❶ Yes, the 13-meal plan
____ ❷ Yes, the 9-meal plan (weekdays only)
____ ❸ Yes, the 7-meal plan (one meal a day)
____ ❹ Yes, the 0-meal plan
____ ❺ No

2) About how much is your average personal spending **EACH WEEK** for **eating out**--for food and beverages bought at restaurants, coffee shops, bars, vending machines, etc. (meals, snacks, non-alcoholic beverages, and alcoholic beverages, including Entree Plus food purchases in the dining halls and elsewhere)? $_____

3) About how much is your average personal spending **EACH WEEK** for **eating at home**--for food and beverages prepared and/or consumed in your living quarters, including delivered food and prepared foods from grocery stores, etc.? $_____

PART C. COSTS FOR BOOKS AND SUPPLIES

1) Please list below the courses in which you are enrolled for **WINTER TERM** and your approximate costs for **books, coursepacks, etc.** for each course. (*Include half the cost of any books purchased during Fall Term which you are continuing to use for a Winter Term course.*)

School	Department	Course Number	Credit	Cost	Condition of Books (check one)
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed
_____	_____	_____	_____	$_____	___New ___Used ___Mixed

2) Please estimate your total cost for course-related **books, coursepacks, etc.** during the **FALL TERM** (include only half the cost of any books you are continuing to use for a Winter Term course also). Fall Books: $_____

3) Please estimate your **FALL TERM** and **WINTER TERM** costs for **general study supplies, copying services, and professional books** (not course-required). Fall: $_____ Winter: $_____

4) Please estimate your **FALL TERM** and **WINTER TERM** costs for **computer equipment, study-related computer software, and purchased computer services.** Fall: $_____ Winter: $_____

5) Please estimate your **FALL TERM** and **WINTER TERM** costs for any **special lab fees** or **special equipment** required for particular courses. Fall: $_____ Winter: $_____

PART D. TRAVEL/TRANSPORTATION COSTS

1) About how many miles is your local residence from campus? (*Enter "0" if you live on campus or less than one mile from campus.*) _____ miles

2. For **WINTER TERM** what percentage of the time do you use (or expect to use) each of the following methods to travel from your residence to your classes and other campus activities?

_____% a. Walking
_____% b. Bicycling
_____% c. Riding a University bus
_____% d. Riding an AATA bus
_____% e. Taking a taxi
_____% f. Driving a car
_____% g. Riding as a passenger in a car
_____% h. Driving a motorcycle
_____% i. Riding as a passenger on a motorcycle
_____% j. Other: _____

3) About how much do you spend **IN AN AVERAGE MONTH** for riding an AATA bus?... $_____/mo.

4) About how much do you spend **IN AN AVERAGE MONTH** for riding in a taxi?..... $_____/mo.

5) Where is your permanent home? _____

6) About how far is your permanent home from the campus? ..... _____ miles

7) How did you get back and forth from your permanent home during the Fall Term? (*Enter the number of roundtrips and the average cost per roundtrip for each of the following methods.*)

	No. of Roundtrips	Average Cost Per Roundtrip
a. Own or family car	_____	$_____
b. Riding in someone else's car	_____	$_____
c. By train and/or bus	_____	$_____
d. By airplane	_____	$_____

__ e. Permanent home is in the Ann Arbor area, or didn't go home during or at the end of Fall Term.

8) About how much did you spend during **FALL TERM** for **other trips** out of Ann Arbor? $_____

9) About how much do you expect to spend during **WINTER TERM** for **non-home trips**? $_____

TRAVEL/TRANSPORTATION COSTS CONT.

10). Do you own a car or have one generally available for your personal use?

___ ❶ Yes ___ ❷ No ------➔ SKIP TO PART E

↓↓↓↓

10a. During the School Year about how much are your **average MONTHLY** expenditures for:

b. Gas and Oil.....$_____/mo.
c. Maintenance.....$_____/mo.
d. Insurance.....$_____/mo.
e. Parking and Fines $_____/mo.
f. Car Payments.....$_____/mo.

10g. During a TYPICAL **WEEK** how many **roundtrips** do you drive from your home to campus? _____

10h. During the 1993-94 SCHOOL YEAR what is your guess of the **total miles** you will drive? _____

10i. During the **SCHOOL YEAR** about what percentage of your driving is for **each purpose** below?

____% j. Commuting to campus or to University-related work (e.g., student teaching)

____% k. Traveling to and from a non-University job

____% l.. Traveling to and from your permanent home (if different from your local home)

____% m. Other local or nonlocal travel

PART E. MISCELLANEOUS PERSONAL EXPENSES

1) About how much were your total **clothing** expenditures over the past 12 MONTHS?..... $_____/yr.

2) About how much do you spend IN AN AVERAGE MONTH for the following categories?

2a) **Laundry and dry cleaning**? ..... $_____/mo.

2b) **Long distance telephone calls** and **optional telephone services**?..... $_____/mo.

2c) **Memberships and dues** in social, recreational, political, etc. organizations and clubs, including sororities and fraternities? ..... $_____/mo.

2d) **Recreation and entertainment**--videos, cable television, concerts, movies, sporting events, lectures, records, c.d.s, tapes, newspapers, magazines, books, sports participation fees, hobbies, games, gambling, etc.?..... $_____/mo.

2e) **Tobacco products**--cigarettes, pipe tobacco, etc.?..... $_____/mo.

MISCELLANEOUS PERSONAL EXPENSES CONT.

(Average MONTHLY expenditures for:)

2f) **Toiletries and personal care**--haircuts, hair styling, shampoo, cosmetics, toothpaste, razors, etc.?..... $_____/mo.

2g) **Contributions** to bucket drives and to churches and other charitable organizations?.. $_____/mo.

2h) **Miscellaneous items** such as pet care, photographic supplies, plants, flowers, gifts, cards, stationery, postal services, faxing, etc.?..... $_____/mo.

2i) **Medical and dental care**, medicines, drugs, and other health care items such as eyeglasses (excluding charges covered by health insurance)?..... $_____/mo.

3) Are you a participant in a health insurance plan? ___ ❶ Yes ___ ❷ No----→SKIP TO Q. 4

↓↓↓↓

3a) About how much do you yourself spend **ANNUALLY** for **health insurance**? ..... $_____/yr.

4) Please list below your **AVERAGE MONTHLY** costs for any **miscellaneous** categories not yet covered.

4a) Dependent child care: ..... $_____/mo.

4b) Life insurance:..... $_____/mo.

4c) _____:..... $_____/mo.

4d) _____:..... $_____/mo.

5) How many credit cards do you currently use? _____ IF NONE, SKIP TO PART F

5a) About how much is your total credit card debt at this time?..... $_____

- - - -

BACKGROUND INFORMATION CONT.

4) For how many **credits** are you enrolled for WINTER TERM? _____

5) For how many **credits** were you enrolled for FALL TERM? _____

6) What is your **gender**?
___ ❶ Male
___ ❷ Female

7) What is your month and year of **birth**? _____

8) What is your **racial/ethnic** background?
___ ❶ Black/Afro-American
___ ❷ Asian
___ ❸ Native American
___ ❹ Hispanic
___ ❺ White/Caucasian
___ ❻ Other:_____

9) What is your current **marital status**?
___ ❶ Never Married
___ ❷ Married
___ ❸ Divorced, Separated, or Widowed

10). Did you **apply** for need-based financial aid through the University of Michigan? ____ ❶ Yes
____ ❷ No

11). Are you currently receiving any **need-based aid** (grants, loans, or work-study)? ____ ❶ Yes
____ ❷ No

12) Are you currently receiving any **non-need-based financial aid** (merit scholarships)? ____ ❶ Yes
____ ❷ No

13) What is the approximate **annual income** of your parent(s)?
____ ❶ Under $20,000
____ ❷ $20,000-30,000
____ ❸ $30,000-40,000
____ ❹ $40,000-50,000
____ ❺ $50,000-60,000
____ ❻ $60,000-80,000
____ ❼ $80,000-100,000
____ ❽ $100,000-200,000
____ ❾ Over $200,000

14) Do you consider yourself financially **independent** from your parent(s)? ____ ❶ Yes
____ ❷ No

PART G. KEEPING AN EXPENDITURE DIARY

As you are probably very much aware by now, it is difficult to accurately remember one's expenditures over a period of a week or a month. In order to obtain more accurate information on the typical expenses of attending the University of Michigan, the Office of Financial Aid is considering paying a small number of students **$50** to keep a complete **expenditure record for the month of March**. The Office will provide the record-keeping materials, and the participating students will just need to remember at least once a day to record all their expenditures for the day. Past participants in such studies have found that being "forced" to keep such complete financial records has been helpful to their own financial planning. If you might be interested in participating in an expense diary study, please give your name, address, and telephone number below.

NAME: _____

ADDRESS: _____

TEL. NO.:_____

PART H. A RESEARCH QUESTION ABOUT IDENTIFYING NUMBERS

For this survey we decided not to include an identifying number on the questionnaire which means that we can't send a personal follow-up request to any selected students who do not respond. Of course the questionnaire data are always treated confidentially whether or not an identifying number is included. What difference do you think an identifying number would have made to you in deciding whether or not to return the questionnaire?

____ ❶ I probably would have returned the questionnaire if it had contained an identifying number..

____ ❷ I probably would not have returned the questionnaire if it had contained an identifying number.

University of Michigan
Office of Financial Aid
February 1994
Tel. 763-4119

The University of Michigan

OFFICE OF FINANCIAL AID

2011 STUDENT ACTIVITIES BUILDING
ANN ARBOR, MICHIGAN 48109

INFORMATION [illegible]

Counselors [illegible]
Directors 313 763-4119
Guaranteed Loans 313 763-4127
Student Employment 313 763-4128

November 25, 1991

Dear University of Michigan Student:

The Office of Financial Aid (OFA) is conducting a survey of a random sample of students who applied for financial aid for the fall term. We would like to use your honest opinions and comments about the quality of your contacts with our Office to further refine our services to the University of Michigan student body.

Please take a few minutes to answer the simple questions on the attached questionnaire as soon as possible (preferably right now--before it gets mislaid--or at least by December 3). Return the completed questionnaire in the campus mail envelope by taking it to a campus mail location in any campus building (front desk of dorms or almost any University administrative or departmental office), or by dropping it in the box in the OFA lobby. Or, you can also mail it to us.

Please note that your answers will be treated in strict confidence and will be used only for statistical analysis along with those of the other students in the random sample. The number on the questionnaire is so we can avoid sending a follow-up mailing to those who have already responded.

I'm sure you know that for the results of a survey to be accurate and useful, answers are needed from a large proportion of the persons in the selected sample. Please take a few minutes to be included. If you have any questions, you may call the OFA Research Associate, Dr. Arthur Wolfe, at 763-4119.

I look forward to receiving your completed questionnaire soon. Thank you for assisting us in our efforts to offer the best possible services.

Sincerely,

Harvey P. Grotrian
Director

P.S. If you have any additional comments on any of the questions, please add them in the margins or add an extra sheet to your returned questionnaire.

SAMPLE: Reminder Postcard

Office of Financial Aid
2011 Student Activities Building

December 2, 1991

Dear Student:

Last week you should have received a questionnaire from the Office of Financial Aid. If you have already completed and returned this questionnaire, I want to thank you very much for your assistance to our office.

If you have not yet had an opportunity to complete your questionnaire, I would appreciate your finding time to do so as soon as possible. For our survey results to be most useful, we need a response from every student in the selected random sample. Thanks for your help. (If you need another copy of the questionnaire, please call Dr. Arthur Wolfe at 763-4119.)

Sincerely,

Harvey P. Grotrian
Director

(RETURN ENVELOPE)

CAMPUS MAIL
Dr. Arthur Wolfe, Research Associate
Office of Financial Aid
University of Michigan
2011 Student Activities Building
Ann Arbor, MI 48109-1316

SURVEY

The University of Michigan

OFFICE OF FINANCIAL AID

2011 STUDENT ACTIVITIES BUILDING
ANN ARBOR, MICHIGAN 48109

INFORMATION 313-763-6600
Counselors 313-763-6600
Directors 313-763-4119
Guaranteed Loans 313-763-4127
Student Employment 313-763-4128

January 15, 1992

Dear University of Michigan Student:

Happy New Year and welcome back to campus!

Toward the end of the Fall term you should have received a questionnaire from the Office of Financial Aid (OFA) relating to our services to students. You were selected as part of a random sample of students who applied for financial aid for the Fall term. We wish to obtain your honest opinions and comments about the quality of your contacts with our Office in order to further refine our services to the University of Michigan student body.

According to our records your questionnaire has not been returned. We realize that the end of last term was probably a very busy time for you, but now we hope you will be able to find a few minutes to complete the enclosed second copy of the questionnaire. We still would very much like to include your experiences and opinions in our survey analysis.

Please return the completed questionnaire in the campus mail envelope by taking it to a campus mail location in any campus building (front desk of dorms or almost any University administrative or departmental office), or by dropping it in the box in the OFA lobby. Or, you can also mail it to us.

Please note that we would like information about your contacts with OFA **prior to and during the Fall term**, in response to your application for 1991-92. Remember that your answers will be treated in strict confidence and will be used only for statistical analysis along with those of the other students in the random sample.

I'm sure you know that for the results of a survey to be accurate and useful, answers are needed from a large proportion of the persons in the selected sample. That is why we are doing this second mailing. Please take a few minutes to be included. If you have any questions, you may call the OFA Research Associate, Dr. Arthur Wolfe, at 763-4119.

I look forward to receiving your completed questionnaire soon. Thank you for assisting us in our efforts to offer the best possible services. We value your comments.

Sincerely,

Harvey P. Grotrian
Director

QUESTIONNAIRE ON SERVICES OF THE OFFICE OF FINANCIAL AID

For each relevant question, please *check* the line in front of the correct answer ignoring any number printed in the box, or fill in the blank lines.

1. Are you currently receiving any nonfamily financial assistance for your study at the University of Michigan?

___ [1] Yes ___ [2] No → *SKIP TO Q2*

↓

1a. Please indicate below all of the types of assistance you are receiving.

___ [1] Pell Grant
___ [1] Supplemental Educational Opportunity Grant
___ [1] University Grant
___ [1] Michigan Grant
___ [1] Other grant, scholarship, or gift: _____
___ [1] Perkins Loan
___ [1] Stafford Loan
___ [1] PLUS, SLS, or Alternative Loan
___ [1] Health Professions Loan
___ [1] Other loans: _____
___ [1] Work-Study employment
___ [1] Other employment during the Fall term

1b. Please rate your satisfaction with the financial aid award package you received.

Total Amount of Aid	**Combination of Types of Aid**
___ [1] Very Satisfied	___ [1] Very Satisfied
___ [2] Fairly Satisfied	___ [2] Fairly Satisfied
___ [3] Somewhat Satisfied	___ [3] Somewhat Satisfied
___ [4] Not Very Satisfied	___ [4] Not Very Satisfied
___ [5] Not At All Satisfied	___ [5] Not At All Satisfied

2. Before your arrival at the University, did you receive any printed information from the University about the policies and procedures for obtaining financial aid?

___ [1] Yes ___ [2] No → *SKIP TO Q3* ___ [3] Don't Remember → *SKIP TO Q3*

↓

2a. Please rate the clarity of this information in explaining what you and your family wanted to know about financial aid.

___ [1] Very Clear ___ [3] Somewhat Confusing
___ [2] Fairly Clear ___ [4] Quite Confusing

2b. Please write below anything you remember about this written information which was confusing or not explained sufficiently.

_____

_____

3. **During the May-August period** before the beginning of Fall term, about how many times did you or another family member *telephone* the Office of Financial Aid *for any reason?*

___ [0] None ___ [1] One ___ [2] Two ___ [3] Three ___ [4] Four ___ [5] Five ___ [6] Six or more
SKIP TO Q4 ↓ ↓ ↓ ↓ ↓ ↓

3a. Please check below all applicable reasons for the call(s).

___ [1] Check on general application procedures and/or request needed forms
___ [1] Check on whether submitted information was received
___ [1] Provide additional information to OFA
___ [1] Check on current status of aid request
___ [1] Check on next steps after receiving an award notice
___ [1] Discuss received award package (aid types, expected contributions, etc.)
___ [1] Discuss reasons for being ineligible for aid or for a reduction in aid
___ [1] Check on status of financial aid payments
___ [1] Check on student accounts statement or a financial "hold credit" problem
___ [1] Seek information about short-term University loans
___ [1] Seek information on Work-Study or other temporary employment
___ [1] Check on Work-Study payment procedures or problems
___ [1] Other: _____

3b. Please rate the helpfulness of this telephone contact in answering your concerns.

___ [1] Very Helpful
___ [2] Fairly Helpful
___ [3] Somewhat Helpful
___ [4] Only A Little Helpful
___ [5] Not At All Helpful

4. During the May-August period before the beginning of Fall term, how many times did you and/or another family member *visit* the Office of Financial Aid for any reason?

___ [0] None ___ [1] One ___ [2] Two ___ [3] Three ___ [4] Four ___ [5] Five ___ [6] Six or more
SKIP TO Q5 ↓ ↓ ↓ ↓ ↓ ↓

4a. Please check below all applicable reasons for the visit(s).

___ [1] Check on general application procedures and/or request needed forms
___ [1] Check on whether submitted information was received
___ [1] Provide additional information to OFA
___ [1] Check on current status of aid request
___ [1] Check on next steps after receiving an award notice
___ [1] Discuss received award package (aid types, expected contributions, etc.)
___ [1] Discuss reasons for being ineligible for aid or for a reduction in aid
___ [1] Check on status of financial aid payments
___ [1] Check on student accounts statement or a financial "hold credit" problem
___ [1] Seek information about or request a short-term University loan
___ [1] Seek information on Work-Study or other temporary employment
___ [1] Check on Work-Study payment procedures or problems
___ [1] Other: _____

4b. Please rate the helpfulness of this in-person contact in answering your concerns.

___ [1] Very Helpful
___ [2] Fairly Helpful
___ [3] Somewhat Helpful
___ [4] Only A Little Helpful
___ [5] Not At All Helpful

5. **Since the beginning of Fall term**, about how many times have you *telephoned* the Office of Financial Aid for any reason?

___ [0] None ___ [1] One ___ [2] Two ___ [3] Three ___ [4] Four ___ [5] Five ___ [6] Six or more
SKIP TO Q6 ↓ ↓ ↓ ↓ ↓ ↓

5a. Have you had any difficulty in getting through to the right person when you have telephoned the OFA?

___ [0] None ___ [1] A little ___ [2] Some ___ [3] Quite a bit ___ [4] A great deal
↓ ↓ ↓ ↓

5b. Please check below any reasons for this difficulty.

___ [1] Busy signal more than once
___ [1] Put on hold for a long time
___ [1] Referred initially to wrong person
___ [1] Other: _____

5c. How useful would it be to you if OFA employed a call prompter system with taped messages, call waiting, and a push button routing system for different types of information?

___ [1] Very Useful ___ [2] Somewhat Useful ___ [3] Not Very Useful

5d. Please check below all applicable reasons for your call(s).

___ [1] Check on general application procedures and/or request needed forms
___ [1] Check on whether submitted information was received
___ [1] Provide additional information to OFA
___ [1] Check on current status of aid request
___ [1] Check on next steps after receiving an award notice
___ [1] Discuss received award package (aid types, expected contributions, etc.)
___ [1] Discuss reasons for being ineligible for aid or for a reduction in aid
___ [1] Check on status of financial aid payments
___ [1] Check on student accounts statement or a financial "hold credit" problem
___ [1] Seek information about short-term University loans
___ [1] Seek information on Work-Study or other temporary employment
___ [1] Check on Work-Study payment procedures or problems
___ [1] Other: _____

5e. Please rate the courteousness of the person(s) you spoke with on the telephone.

___ [1] Very Courteous
___ [2] Fairly Courteous
___ [3] Somewhat Courteous
___ [4] Only A Little Courteous
___ [5] Not Courteous At All

5f. Please rate the understanding of and knowledgeability about your financial aid concerns of the person(s) you spoke with on the telephone.

___ [1] Very Knowledgeable
___ [2] Quite Knowledgeable
___ [3] Fairly Knowledgeable
___ [4] Somewhat Knowledgeable
___ [5] Not Very Knowledgeable
___ [6] Can't Say

5g. Please rate the helpfulness of your telephone call(s) in answering your concerns.

___ [1] Very Helpful
___ [2] Fairly Helpful
___ [3] Somewhat Helpful
___ [4] Only A Little Helpful
___ [5] Not At All Helpful

6. Since the beginning of Fall term, about how many times have you gone to the *front advising counter* in the Office of Financial Aid for any reason?

___ 0 None ___ 1 One ___ 2 Two ___ 3 Three ___ 4 Four ___ 5 Five ___ 6 Six or more
SKIP TO Q7 ↓ ↓ ↓ ↓ ↓ ↓

6a. On the average, about how many minutes have you had to wait until you reached the front counter?

___ 0 None ___ 1 1-5 ___ 2 5-10 ___ 3 10-15 ___ 4 15 +

6b. Please check below all applicable reasons for your visit(s).

___ 1 Check on general application procedures and/or request needed forms
___ 1 Check on whether submitted information was received
___ 1 Provide additional information to OFA
___ 1 Check on current status of aid request
___ 1 Check on next steps after receiving an award notice
___ 1 Discuss received award package (aid types, expected contributions, etc.)
___ 1 Discuss reasons for being ineligible for aid or for a reduction in aid
___ 1 Check on status of financial aid payments
___ 1 Check on student accounts statement or a financial "hold credit" problem
___ 1 Seek information about or request a short-term University loan
___ 1 Other: _____

6c. Please rate the courteousness of the person(s) you spoke with at the front counter.

___ 1 Very Courteous
___ 2 Fairly Courteous
___ 3 Somewhat Courteous
___ 4 Only A Little Courteous
___ 5 Not Courteous At All

6d. Please rate the understanding of and knowledgeability about your financial aid concerns of the person(s) you spoke with at the front counter.

___ 1 Very Knowledgeable
___ 2 Quite Knowledgeable
___ 3 Fairly Knowledgeable
___ 4 Somewhat Knowledgeable
___ 5 Not Very Knowledgeable
___ 6 Can't Say

6e. Please rate the helpfulness of your front counter visit(s) in answering your concerns.

___ 1 Very Helpful
___ 2 Fairly Helpful
___ 3 Somewhat Helpful
___ 4 Only A Little Helpful
___ 5 Not At All Helpful

7. Since the beginning of Fall term, how many times have you had a pre-arranged or walk-in *meeting* with an Office of Financial Aid counselor for any reason?

___ [0] None → *SKIP TO Q8*

___ *(Number of pre-arranged meetings)*

___ *(Number of walk-in meetings)*

7a. On the average, about how many minutes have you had to wait for a walk-in meeting with a counselor?

___ [0] None ___ [1] 1-5 ___ [2] 5-10 ___ [3] 10-20 ___ [4] 20-30 ___ [5] 30-45 ___ [6] 45+

7b. Please check below all applicable reasons for the meeting(s).

___ [1] Check on general application procedures and/or request needed forms
___ [1] Check on whether submitted information was received
___ [1] Provide additional information to OFA
___ [1] Check on current status of aid request
___ [1] Check on next steps after receiving an award notice
___ [1] Discuss received award package (aid types, expected contributions, etc.)
___ [1] Discuss reasons for being ineligible for aid or for a reduction in aid
___ [1] Check on status of financial aid payments
___ [1] Check on student accounts statement or a financial "hold credit" problem
___ [1] Receive budget counseling
___ [1] Seek information about or request a short-term University loan
___ [1] Other: _____

7c. Please rate the courteousness of the counselor(s) you met with.

___ [1] Very Courteous
___ [2] Fairly Courteous
___ [3] Somewhat Courteous
___ [4] Only A Little Courteous
___ [5] Not Courteous At All

7d. Please rate the understanding of and knowledgeability about your financial aid concerns of the counselor(s) you met with.

___ [1] Very Knowledgeable
___ [2] Quite Knowledgeable
___ [3] Fairly Knowledgeable
___ [4] Somewhat Knowledgeable
___ [5] Not Very Knowledgeable
___ [6] Can't Say

7e. Please rate the helpfulness of the meeting(s) with a counselor in answering your concerns.

___ [1] Very Helpful
___ [2] Fairly Helpful
___ [3] Somewhat Helpful
___ [4] Only A Little Helpful
___ [5] Not At All Helpful

5

8. Since the beginning of Fall term, about how many times have you gone to the OFA *student employment office* for any reason?

___ [0] None ___ [1] One ___ [2] Two ___ [3] Three ___ [4] Four ___ [5] Five ___ [6] Six or more

SKIP TO Q9 ↓ ↓ ↓ ↓ ↓ ↓

8a. On the average, about how many minutes have you had to wait in order to obtain assistance from the student employment staff?

___ [0] None ___ [1] 1-5 ___ [2] 5-10 ___ [3] 10-15 ___ [4] 15 +

___ [9] No assistance needed on any visit

8b. Please check below all applicable reasons for your visit(s).

___ [1] Seek information on Work-Study positions

___ [1] Seek information on temporary employment positions

___ [1] Complete Work-Study employment paperwork

___ [1] Obtain Job Posting Request form for employer

___ [1] Check on Work-Study payment procedures or problems

___ [1] Other: _____

8c. Please rate the courteousness of the student employment staff who assisted you.

___ [1] Very Courteous

___ [2] Fairly Courteous

___ [3] Somewhat Courteous

___ [4] Only A Little Courteous

___ [5] Not Courteous At All

___ [6] Didn't Get Assistance

8d. Please rate the understanding of and knowledgeability about your employment concerns of the student employment staff who assisted you.

___ [1] Very Knowledgeable

___ [2] Quite Knowledgeable

___ [3] Fairly Knowledgeable

___ [4] Somewhat Knowledgeable

___ [5] Not Very Knowledgeable

___ [6] Can't Say

8e. Please rate the helpfulness of your visit(s) to the student employment office in answering your employment concerns.

___ [1] Very Helpful

___ [2] Fairly Helpful

___ [3] Somewhat Helpful

___ [4] Only A Little Helpful

___ [5] Not At All Helpful

9. **Since the beginning of Fall term**, about how many times have you gone to the OFA *payment questions desk* at the far north end of the OFA hall for any reason?

___ [0] None ___ [1] One ___ [2] Two ___ [3] Three ___ [4] Four ___ [5] Five ___ [6] Six or more
SKIP TO Q10 ↓ ↓ ↓ ↓ ↓ ↓

9a. On the average, about how many minutes have you had to wait to obtain assistance from the payment questions staff?

___ [0] None ___ [1] 1-5 ___ [2] 5-10 ___ [3] 10-15 ___ [4] 15+

9b. Please check below all applicable reasons for your visit(s).

___ [1] Check on whether submitted information was received
___ [1] Provide additional information to OFA
___ [1] Check the reason an award payment was not yet available
___ [1] Check the reason a private scholarship payment was not yet available
___ [1] Check on student accounts statement or a financial "hold credit" problem
___ [1] Turn in a private scholarship check co-payable to the University
___ [1] Obtain a duplicate copy of an award notice
___ [1] Other: _____

9c. Please rate the courteousness of the payment questions staff who assisted you.

___ [1] Very Courteous
___ [2] Fairly Courteous
___ [3] Somewhat Courteous
___ [4] Only A Little Courteous
___ [5] Not Courteous At All

9d. Please rate the understanding of and knowledgeability about your payment concerns of the payment questions staff who assisted you.

___ [1] Very Knowledgeable
___ [2] Quite Knowledgeable
___ [3] Fairly Knowledgeable
___ [4] Somewhat Knowledgeable
___ [5] Not Very Knowledgeable
___ [6] Can't Say

9e. Please rate the helpfulness of your visit(s) to the payment questions desk in answering your payment concerns.

___ [1] Very Helpful
___ [2] Fairly Helpful
___ [3] Somewhat Helpful
___ [4] Only A Little Helpful
___ [5] Not At All Helpful

10. In general, how would you rate the quality of the service that you have received from OFA personnel this fall?

___ [1] Very Good
___ [2] Fairly Good
___ [3] Satisfactory
___ [4] Marginally Acceptable
___ [5] Poor
___ [6] No Contact

11. Please describe below any particularly helpful service which you received from an OFA staff person.

_____

_____

_____

_____

_____

12. Obtaining financial aid is a process which requires quite a bit of paper work. Please indicate below to what extent each of the following has caused problems for you.

	No Problems	Some Problems	Many Problems
a. Filling out financial aid application forms	___ [1]	___ [2]	___ [3]
b. Submitting requested documents on time	___ [1]	___ [2]	___ [3]
c. Submitted documents being not easily located	___ [1]	___ [2]	___ [3]
d. Receiving duplicate copies of OFA award forms, requests for documents, etc.	___ [1]	___ [2]	___ [3]

13. Currently the Office of Financial Aid closes at 4:00 p.m. Except for the first two weeks of the term, it also is closed over the noon hour and until 10:00 a.m. on Thursdays. Have these closed times been a problem for you at all this fall?

___ [1] No, not at all ___ [2] Yes, a little problem ___ [3] Yes, a big problem

14. If OFA hours were extended, which of the following would likely be most helpful to you?

___ [1] Open during the noon hour
___ [2] Open from 4:00 to 5:00 p.m.
___ [3] Open one or two evenings each week
___ [4] Open Thursday mornings before 10:00

15. Finally, if you have any specific suggestions about things which OFA might do to make the process of applying for and obtaining financial aid and student employment positions more understandable, efficient, convenient, etc., please indicate them below.

_____

_____

_____

_____

_____

8

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CHAPTER 5

Models and Simulations in Financial Aid Administration and Research*

John Curtice

Reality is messy. At least it seems so for an analyst or researcher trying to understand how it works. Certainly engineers, biologists and even mathematicians find the complexity of nature and the physical universe to be demanding. Social scientists and social engineers, a group which might include financial aid officers, must cope with their own messy realities. Often what is needed to understand the complexities of the real world is a simplified depiction of it. Such a depiction might contain fewer moving parts (variables) or perhaps change at a slower rate (or not at all) when compared to the real thing.

Two analytic tools, models and simulations, involve the creation and use of an "artificial reality," one which contains the operative elements of true reality, but is less complex and more manageable. This "synthesized" reality is used to test assumptions and to observe the effects of changes to one variable on the behavior of others or on the "system" as a whole. Models and simulations have useful applications in understanding student financial aid. This chapter explores the application of modeling and simulation techniques to tasks related to student financial aid research and administration.

Part of the appeal of using models and simulations lies in their reliance on an intuitive approach to decision making and problem solving. Compared to descriptive or analytic statistics, for example, use of models and simulations relies more on expertise about the system being studied than on mastery of the analytic tool. For financial aid administrators, this means that they can (and do) use models and simulation techniques based on their expertise and insights about how financial aid works. Although models can be extremely complex and sophisticated, several key principles keep the techniques and their benefits accessible to a wider population.

For example, models and simulations work because, as a general rule—although many variables and complex relationships are present in reality—most causality is explained by only a few variables. So a simplified depiction of a single event, or even of a complex system, can yield useful information about how that system works. Furthermore, at least one practitioner of modeling theory cautions us that "the extent to which a phenomenon is understood is inversely proportional to the number of variables required to explain it" (Ackoff and Sasieni 1967).

Models are also appealing because they are simpler to use than the more rigorous statistical and scientific methods (Graybeal and Poouch 1984). For example, descriptive models can be used productively without the need to formulate a formal hypothesis about causality between dependent and independent variables as in the use of flow charts or graphs.

Examples of physical models and simulations are abundant in engineering and manufacturing. Design laboratories are full of simulators to approximate the affects of selected "real world" elements. Wave tanks show the affects of hull shapes on ship speed and stability. Wind tunnels suggest how wing designs affect drag and lift. Hydraulically driven platforms simulate the motion of an earthquake. These examples may seem to have little application in financial aid, but other examples from business, management and political science seem more pertinent. The literature in these areas discusses the use of modeling and simulation techniques in understanding market and voter behavior or choosing optimal

*The author wishes to thank George Chin, University Director of Student Financial Aid at the City University of New York, for his generous assistance with materials and ideas for this chapter.

distribution routes. These problems are not dissimilar to college admissions marketing issues, student enrollment decisions, tuition pricing functions, or the allocation problems associated with award packaging. Modeling and simulation activities are already underway in financial aid administration. To better understand their current use in financial aid, it is helpful to have some basic idea of the kinds of models there are and the relationship between models and simulations.

Models

A good discussion of the classification of models is found in the literature of operations research (Ackoff and Sasieni 1967). Models can be classed by their "physicality." *Analogues* use one set of (more easily managed) properties to represent another. Graphs use geometric shapes to represent amount and proportion. It is easier to manipulate the lines, arrows and boxes on a flow chart than it is to alter the system and the processes the chart represents.

Somewhat less physical are *symbolic* models, which use abstract notations (letters and numbers in the form of equations) to represent variables and the relationships between them. Symbolic models are very flexible and easily modified, but they are less intuitive and more complex than physical models. All formulas are symbolic models; the Federal Methodology of need analysis is a system of interrelated symbolic models.

A typical example of an analogous model in financial aid is the design of a new information management system or the revision of an existing system. For example, many financial aid offices began the task of coping with the massive delivery system changes occasioned by the Higher Education Amendments of 1992 by visualizing the path of applicant data and processing tasks on a flow chart (Fig. 5-1). To some degree, the impact of mandated changes could be assessed by making changes to the lines and boxes on the chart. This process often suggested alternative accommodations which might not have evolved with a less visual representation.

Another important characteristic of models is their *descriptive, normative* or *predictive* intent. *Descriptive* models help us understand what is already happening and to plan for changes. A flow chart identifying the FAFSA and other data entry forms and illustrating the flow of data from those forms to various processing entities is a descriptive model.

Normative models are intended to set standards of behavior to which the real world is expected to conform. Normative models express some value. Taxation systems of all sorts are normative models because they imply a set of values related to community and society. As originally conceived, need analysis represented a normative model. It expressed a standard by which families are expected to contribute to the education of their children (EFC). Some observers suggest this is the major distinction between the Federal and Institutional Methodologies. They suggest that the Federal Methodology (FM) describes eligibility for financial aid while Institutional Methodology (IM) assesses ability to pay. IM implies an underlying set of values related to the benefits of education. Over time, the normative aspect of need analysis devolved into a descriptive model used to determine eligibility and away from a normative model used to assess ability to pay.

Predictive models attempt to explain the real world in terms of the relationships among variables. These models involve more sophisticated empirical and statistical techniques. Typically, a hypothesis about the relationship between variables is conceived and the model formulated. Because an effect observed in the "real world" may be the result of more than one variable, statistics are used to isolate the effect of each variable. For example, a predictive model of family contribution would attempt to determine actual rather than expected family contribution. Such a model might look very much like need analysis; it would use input variables such as income and assets, but cost of education would probably be a more important predictor of what families actually pay.

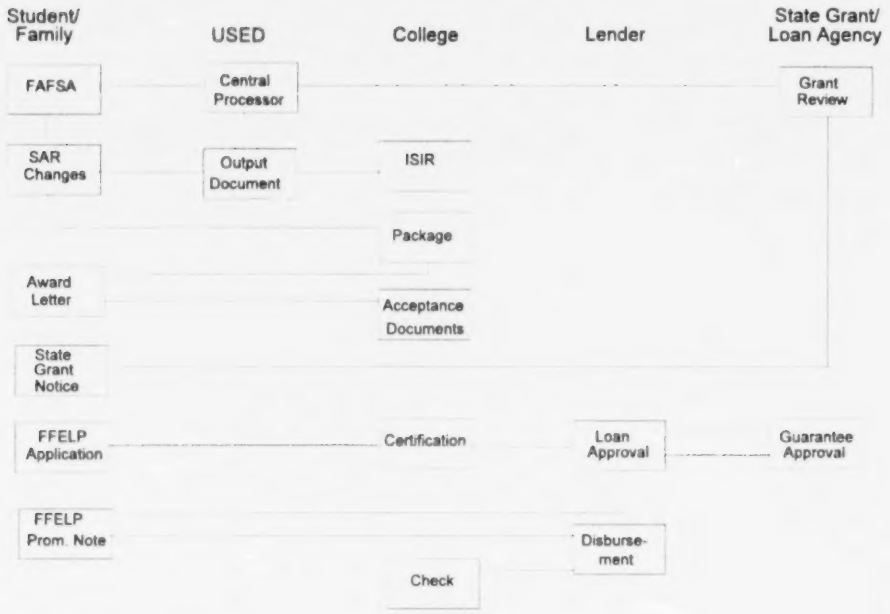

Fig. 5-1. Sample Descriptive Model of the Financial Aid Application Process.

Models can be characterized on the basis of what is known or knowable about the nature and content of the activity being studied. Here the researcher's knowledge of the underlying system is critical to the quality of the model. Expertise, insight, intuition and creativity all play a role in how well the model represents reality and how useful it is. But this means that financial aid administrators can use their knowledge of the programs to develop models and test relationships between variables.

For example, the structures of some systems are simple enough to be understood by direct inspection and observation. The relationship between award packaging and fund accounting is fairly evident. Overly generous packaging rules or inaccurate projections about acceptance rates will deplete fund balances. The relationship can be modeled in a diagram, or the historical relationship between funds offered and funds accepted can be symbolized by formulas. In other systems, the relationship of variables may be known, but the problem lies in how to represent them in the model—requiring ingenuity and creativity on the part of the researcher.

In financial aid the relationship of variables is often unknown or unknowable. These circumstances require the researcher to go beyond descriptive models to formulate viable hypotheses and, perhaps, to collect data. Because financial aid administration operates in a highly regulated environment which is, furthermore, product and service oriented, there are usually few resources (and even less inclination) available for research activities such as data collection.

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Chapter 5

Simulations

A simulation is the manipulation or activation of a model. Models are static; simulations are dynamic. Simulations require a previously existing model. A clay mock-up of an automobile prototype sitting on the testbed in a wind tunnel is a model; it becomes a simulation when the huge fans are started and air flow and pressure measurements are taken. Simulations of symbolic models involve the application of data to mathematical equations. Frequently, these calculations are conducted by computer.

Operations research literature suggests five benefits of using simulations (Adkins and Poouch 1977). They include:

1. Controlled substitution of variables. Simulations can be run repeatedly with modified inputs. In constructing student living budgets, an aid officer can use different housing cost inflators to estimate changing off-campus room costs. Or alternative assumptions about the most appropriate ratios of grant, loan and work can be used to drive packaging simulations.

2. Time compression. Aided by the speed of computers, but based mostly on the control implicit in a model, a series of simulations can be executed much faster than the same series of trials in reality. It might take days or even weeks to determine the effects of a revised packaging plan if the awards had to be prepared manually.

3. Sensitivity analysis. The heart of any simulation effort is the determination of the effect of a given change in input (independent) variables. If income increases $1,000, how much does EFC rise? For each $100 increase in housing costs, how many students will move off campus?

4. Preservation of the real system or phenomenon being studied. In the physical sciences, the consequences of errors in experimentation in the real world can result in the classic high school chemistry lab explosion, or worse. In financial aid, real-life consequences preclude the option of testing alternative schemes on students. Most aid administrators would be unwilling, for example, to test the effects of award packages on enrollment decisions by offering "good" packages to one group and "bad" packages to another group.

5. Use as a learning tool. Few methods can teach the nature of relationships between variables and create an understanding of a system as effectively as repeated observations. Successive manipulation of a series of variables can help gain an intuitive sense of system dynamics which would be difficult to attain by any other method.

Of course, simulation techniques are not without their limitations. Developing complex simulations can require considerable planning and personnel resources. Simulations which use large amounts of computer CPU time can become expensive. Errors in assumptions about the nature of the underlying relationships between elements of the system can cause the model to diverge from reality in some significant way, producing unreliable results. It may be difficult to determine initial values for the model; as noted above, data concerning the dynamics of variables in financial aid are sometimes either unknown or unknowable. These limitations suggest a critical and rigorous assessment of the appropriateness of the model-simulation methodology and a careful analysis of the expected costs and benefits.

Several general classes of simulations can be distinguished based on the type of data being applied to the model, the control we have over the variables, and the resulting precision with which the simulation explains or predicts reality. For example, suppose an aid office needed to determine the effect on its

applicant pool of the elimination of home equity as a factor in measuring ability to pay for college. If resources were available, the researcher might choose to run a simulation on the entire applicant file by setting home equity equal to zero and recalculating financial need for all students. Simulations frequently are populated with historical data representing actual cases. The results would demonstrate the actual effect of the elimination of home equity on a particular population. Such a simulation would take into account the uneven distribution of home equity across a particular applicant pool. No statistical inference would be necessary. The result of the simulation would be the observed decreased expected family contribution caused by elimination of home equity from the need analysis model. Estimates about the institution's ability to meet the resulting increased financial need and the likely effects on enrollment decisions could then be made.

But if the applicant pool were too large or resources were not available to review every record, the simulation could be run on a statistically representative sample drawn from the total population. This procedure requires resources and skill in selecting and validating a random sample; otherwise, extrapolations to the total population may not be valid.

A smaller representative sample can be extracted once as part of normal operations procedures and kept available for a variety of investigations. This procedure is useful on very large data sets because the computing resources required to manipulate many records or variables are costly. (Such representative subsets have been a mainstay of analysis where the total data set includes millions of records but frequent policy analysis inquiries can only be satisfied by frequent simulations.) Again, EFCs could be recalculated with the value of home equity set to zero. Then results could be generalized to the total applicant pool.

Because of limitations of time and resources, some data requests can only be met with illustrative data. In such circumstances, data for a simulation can consist of a group of actual cases not chosen according to the strict rules of sampling technique. These representative cases can be drawn from actual files or be totally fictitious but, based on the researcher's familiarity with the larger population, can provide some useful indications about other records in the data base. For example, a number of families with home equities falling between $50,000 and $500,000 could be selected at random from the "live" data. Alternatively, the researcher might create twelve families, two each from the $10,000 income bands between $20,000 to $70,000, and make a series of assumptions about family size, number in college, and other characteristics including home equity. Created data can be used as long as no attempt is made to claim the findings are known to be statistically representative of the actual population. In working with large data sets, one becomes familiar with broad characteristics of a population. The collective impression of a group of financial aid counselors who have reviewed the applicant pool in the process of reviewing aid eligibility can provide an acceptable estimate of the distribution and range of a variable like home equity.

In student financial aid, models are often prescribed by legislation or regulation. Others are set by federal, state, institution or office policy. The "grand model" of financial aid is the deceptively simple formula which most aid officers learned their first day: *Total Cost - Family Contribution = Financial Need*. Implied in the relationships in this model are all the intricacies driving the larger system. "Total Cost" is a function of tuition, fees, room and board, etc., and each of these elements is, in turn, driven by its own set of dynamics. Tuition is determined by the cost of instruction (largely, but not exclusively, faculty salaries), supplies and equipment, utilities, debt service, etc. Room and board costs are a function of the cost of operating housing and auxiliary services. Likewise, expected family contribution is a result of the elements of the need analysis formula: family size offsets, asset protection allowances, and adjusted available income assessment rates.

Applications and Problems in Financial Aid Research

To illustrate the use of models for analytic purposes, let us review three examples. The first concerns the New York State grant program; the problem is to assess the impact on students of proposed changes in the award formula. The second example uses a quick, straight-line projection to estimate the effect of the proposed federal budget on institutional Title IV funding; the problem here is to quickly apprise senior staff so they can respond to media inquiries. The third example uses the NACUBO Tuition Discounting Model; the problem is to determine the tuition and financial aid levels of diminishing returns.

New York State Tuition Assistance Program (TAP)

Many states use a modified federal methodology to calculate student grant eligibility. New York uses its own algorithm which works like the IRS income tax rate schedules (Table 5-1). Basically, the maximum award is set in statute and is reduced as income rises.

TABLE 5-1. TAP Award Schedule: Calculation of Reduction from Maximum Award ($3,650)

Income Range*	Fixed Reduction	Percent Reduction	On Amount Over
$0 to 7,500	----------	No Reduction	----------
7,501 to 11,000	75 plus	7% of income >	7,500
11,001 to 18,000	320 plus	10% of income >	11,000
18,001 to 42,500	1,020 plus	12% of income >	18,000
Over 42,500	----------	No Award	----------

The award for a student where the family income is $15,500 would be $2,880, calculated as follows: the maximum award of $3,650 minus the reduction amount, which is the sum of the fixed reduction of $320 plus 10% of income over $11,000, or $3,650-{320+[10% x (15,500-11,000)]}.

A typical policy analysis problem might involve modifying the award schedule to achieve a different distribution of funds. The proposed change might target funds to a wider or narrower population or to cut program expenditures. What effect will these proposals have on the student population? How will the share of program funds change? How will students in different income ranges be affected? These questions can be answered by using the award reduction algorithm as a model and simulating the proposed changes. First, the actual or estimated income distribution of current program recipients must be determined. If unit record data are available and can be manipulated, a simulation can be based on individual recipient data or on grouped data. Second, to establish a benchmark, the current award formula

*TAP uses New York "Net Taxable Income"

is applied to the income frequency distribution. Next, the proposed schedule is applied to the data so that changes from the benchmark can be calculated. Finally, the changes must be put in a presentation format.

As an example of these steps, let's say a proposal were put forth to modify the TAP award formula as in Table 5-2:

TABLE 5-2. Proposed TAP Award Schedule: Calculation of Reduction from Maximum Award ($3,650)

Income Range*	Fixed Reduction	Percent Reduction	On Amount Over
$0 to *8,000*	----------	No Reduction	----------
8,001 to 11,000	*50* plus	*5%* of income >	*8,000*
11,001 to 18,000	*200* plus	*8%* of income >	11,000
18,001 to 42,500	*760* plus	*10%* of income >	18,000
Over 42,500	----------	No Award	----------

The italicized changes represent an enhancement for recipients. Assume recipient data are available as an income frequency distribution and the data are arrayed in $1,000 income bands. We would know, for example, that there are 572 recipients in the $18,000 to $19,000 income range and that we have similar data for incomes from $0 to $42,500, which is the current income cutoff. To estimate the current cost of the program for recipients in the $18,000 to $19,000 income band, use the midpoint of $18,500:

$18,500 - 18,000 = 500
500 x .12 = 60
60 + 1,020 = 1,080
3,650 - 1,080 = 2,570
2,570 x 572 = $1,470,040

To estimate the cost of the proposed enhancement, apply the same procedure using the algorithm in Table 5-2:

$18,500 - 18,000 = 500
500 x .10 = 50
50 + 760 = 810
3,650 - 810 = 2,840
2,840 x 572 = $1,624,480

*TAP uses New York "Net Taxable Income"

The difference between the benchmark costs and the enhanced costs represents the additional expenditure the State must make to fund the enhancement. Under this enhancement, the State's added cost to fund recipients from families with incomes between $18,000 and $19,000 is approximately $154,440. The same estimation procedure can be applied to each income band and these can be summed to a total added program expenditure. In addition, the effect of the proposal can be seen on different income ranges.

This simulation can be managed with minimal data processing resources, and without extensive expertise, on an electronic spreadsheet. (The award data also can be displayed in graph form to quickly summarize the effect of the proposal.) For example, the award calculation portion of the simulation uses look-up tables and appears, in part, as follows:

TABLE 5-3. Lotus Worksheet for a State Grant Simulation

Income Mid-Pt.	CURRENT (Benchmark) Reduction	Award	PROPOSED Reduction	Award
$ 0	0	3,650	0	3,650
500	0	3,650	0	3,650
1,500	0	3,650	0	3,650
2,500	0	3,650	0	3,650
3,500	0	3,650	0	3,650
4,500	0	3,650	0	3,650
5,500	0	3,650	0	3,650
6,500	0	3,650	0	3,650
7,500	0	3,650	0	3,650
8,500	145	3,505	75	3,575
9,500	215	3,435	125	3,525
10,500	285	3,365	175	3,475
11,500	370	3,280	240	3,410
12,500	470	3,180	320	3,330
13,500	570	3,080	400	3,250
14,500	670	2,980	480	3,170
15,500	770	2,880	560	3,090
16,500	870	2,780	640	3,010

Current - Benchmark		
0	0	0%
7,500	75	7%
11,000	320	10%
18,000	1,020	12%
Maximum Award =		3,650
Minimum Award =		100

Proposed		
0	0	0%
8,000	50	5%
11,000	200	8%
18,000	760	10%
Maximum Award =		3,650
Minimum Award =		200

The graph in Figure 5-2 clearly illustrates that the proposal has the effect of increasing awards, compared to the benchmark, as income rises. While this outcome may not be consistent with the principles of need analysis, all students benefit under the plan. Based on these simulation efforts, analysts can advise senior staff about the positive and negative aspects of the proposal.

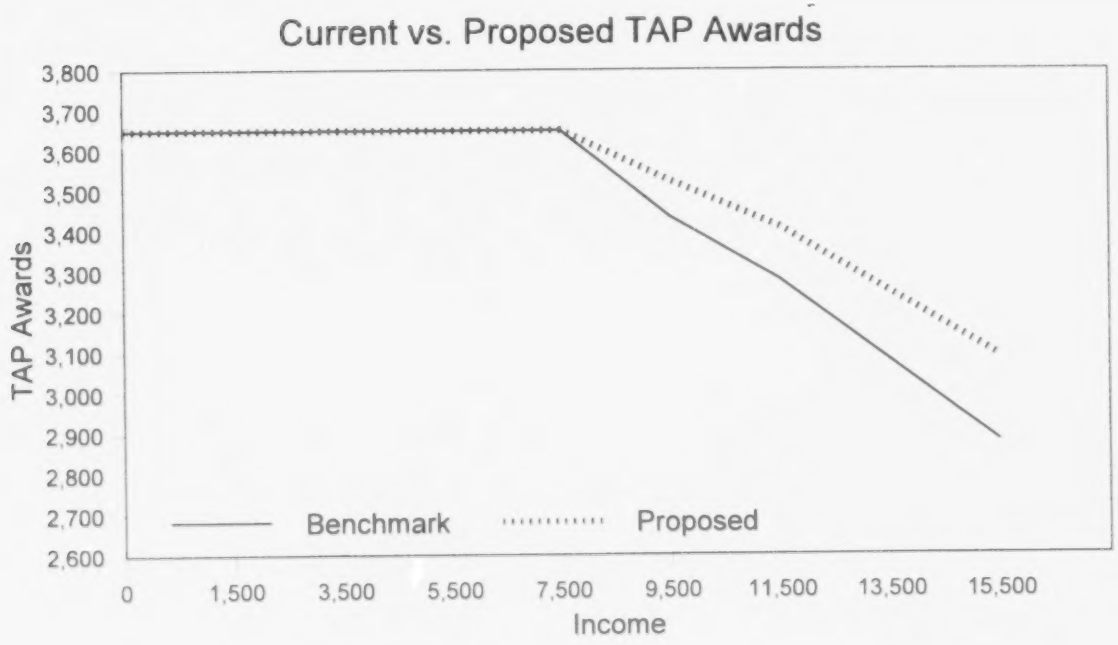

Fig. 5-2. Current vs. Proposed TAP Awards.

Federal Title IV Budget Analysis: Straight Line Projections

Your president needs to know quickly how the Administration's budget proposal will affect your institution. The Budget has just been released in Washington and your local press is expected to ask area institutions about the impact. You know that an increase in Pell Grant funding will not automatically mean increases in Pell Grant awards at your campus, or that a reduction in Perkins Federal Capital Contributions (FCC) will necessarily mean fewer loan funds will be available to your students. There is no clear direct link between changes in national funding levels and the receipt of aid by your institution and your students, even though this might seem a logical expectation. An increase in Pell Grant funding may be intended to pay a previous year's shortfall. A decrease in Perkins FCC would not affect your students if you were not previously receiving these contributions. A thorough forecasting would involve a simulation of the federal and state "fair allocation" formula. Time and resource limitations usually would not permit this approach.

In these circumstances, a simple comparative table may be in order. The simulation methodology is no more complex than a straight-line projection of the changes at the federal level to your local situation. If Pell Grant funds are scheduled to increase 8% nationally, and if you have no firm reason to believe otherwise, a projected 8% increase in campus Pell is not unreasonable. Such straight-line projections may not reflect sophisticated statistical procedures, but they are often the only methods which fit the limitations of resources and the constraints of time.

The NACUBO Tuition Discounting Model

During the last ten years, most colleges and universities, especially those in the private sector, significantly increased the amount of institutional resources used for financial aid. The College Board (1994) estimates that "Institutional and Other Grants" grew 216% from 1984-85, and from $2.556 billion to $8.081 billion in 1993-94.

The objective in using institutional funds is to attract and enroll students who would not otherwise attend. Most of these funds come from other institutional revenue and are, in effect, a tuition discount for selected students. As with all expenditures, the cost of institutionally supported student financial aid drives up the price of tuition. A central fiscal policy question is this: at what point does the increased price of tuition negatively affect net revenue? At what point does the increase in full-price tuition drive away more students than the discounted tuition attracts?

The relationships between enrollment decisions, sources of revenue and financial aid policies are complex and dynamic. The National Association of College and University Business Officers (NACUBO 1993) created the Tuition Discounting Model (TDM) as a forecasting tool to "analyze the relationship between tuition rates and the various sources available to students to fund the tuition portion of their education."* The TDM is an excellent example of the use of a symbolic model to solve a financial-aid related policy issue. It relies on the following four categories of variables to drive the simulation:

1. Student cost and ability to pay: tuition, non-tuition costs, family ability to pay (expected growth in EFC).

2. Externally funded financial aid: aggregate FSEOG, FWS, Perkins, and maximum State award and Stafford loan; and expected growth in these programs.

3. Institutional funding and costs: number and expected growth in FTE full-cost-of-attendance non-need-based tuition discounts, aggregate need remaining after external funding, availability of institutional loan funds based on projected collections.

4. Other external and institutional variables: the maximum Pell award for a particular year, the institution's percentage of Pell recipients who also receive Presidential Access Scholarships (in which case the student may receive a 25% "Pell bonus"), and the number of FTE first- and second-year students.

While most of the data for the TDM will be generally available at most institutions, some of the projections will be difficult to calculate or estimate. For example, how would one project the rate of growth of family or student resources for the next ten years? Historical records probably are not much help because of recent dramatic changes in need analysis. And, as always, the value of the simulation results depends on the accuracy of the data input. At the same time, modeling and simulation techniques, when used for long-range planning, should be considered process oriented rather than product oriented. In any case, from these variables, the TDM produces a summary of input statistics and fifteen output tables projecting changes in key fiscal indicators over a ten-year span.

Many of the tables include a "sensitivity analysis" which illustrates the effect of a plus or minus 1% and plus or minus 2% change in one of the key input variables. For example, a table on tuition

*Chapter 9 of this volume, by Nathan Dickmeyer, discusses the theory and application of the tuition discounting model.

discounting at alternative levels of tuition growth shows the affect on net tuition if the rate of tuition change increases or decreases by 1% and 2% from the initial value for this input variable.

Financial aid administrators are encouraged to try the TDM. It provides a glimpse of the dynamics of decision making related to tuition policy and provides a better grasp of the interplay of variables and the role of financial aid in tuition policy.

Conclusions

Using models and simulations in financial aid research and administration yields useful information for planning. They are helpful in projecting the effects of changes in policies and procedures and in explaining those changes to others. The techniques are particularly attractive because useful models and simulations rely on a researcher's familiarity with the financial aid process, rather than with strictly defined methodologies.

Models and simulations can range from extremely complex and abstract symbolic formulas to simple and concrete flow charts or graphs. The guiding principal is that models should be as simple as possible, given the complexity of the phenomenon being modeled. This presupposes a thorough understanding of the nature and direction of influences among variables. For example, including home equity in need analysis will generally raise EFC; decreasing taxation rates will lower EFC. To keep the model simple, include only those variables expected to have the most impact on the thing being examined.

Many financial aid-related issues lend themselves to a better understanding through the use of models. Some aid officers use a survey to periodically collect student cost data to formulate budgets but use a model to project cost increases between surveys. The model may be based on an urban or rural housing cost inflator obtained from the local real estate board. Other offices use a modeling and simulation approach to test the outcomes of alternative packaging philosophies. They may place an emphasis on funding all students at a certain need level with a minimum percentage of gift aid. Or they may begin with a fixed amount of self-help assistance for all students, regardless of family circumstances. The packaging simulations will help determine how these different approaches affect program expenditures.

Careful consideration must be given to the presentation of the results of a simulation. A balance must be struck between distracting the listener with details of the simulation or model and leaving the impression that the results are simply contrived. Usually, a brief description of the model and the simulation procedure is sufficient to suggest the essential relationships between variables.

There are opportunities to use modeling and simulation techniques in researching administrative issues: for example, illustrating how student aid funds flow from the aid office to student accounts. One might examine the volume and duration of student contacts, creating a formula relating the number of contacts to the number of applications. The elements of that formula might be modified if the student is chosen for verification or is an out-of-state student. A further refinement might estimate the expected number of student contacts in the future based on the estimated number applications. These are only a few examples of possible applications; with adequate resources, practicing aid administrators can conceive of and profitably use many others.

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CHAPTER 6

National Data Bases for Student Aid Researchers

Laura Greene Knapp

Gathering financial aid data from one's own campus resources and conducting original research using this data is valuable for numerous reasons, which are explored in detail in the preceding chapters. Once compiled, this information becomes even more valuable when it is placed in a larger context. This is accomplished by comparing characteristics of a single institution with those of a group of institutions—institutions of similar type, control, or size—or all institutions. Likewise, information about financial aid recipients on one campus becomes more useful when compared with national information about financial aid recipients at similar institutions, with similar income levels, or with similar aid packages.

Often, when presenting statistics to campus administrators, other financial aid officers, or the general public, specific situations from a single campus become more understandable and significant when displayed against similar situations at other institutions. Likewise, comparing trends on one campus to national trends can serve to explain why the single campus is experiencing certain reactions to stimuli such as policy changes or demographic shifts. These comparisons also can illustrate how a single campus has overcome these stimuli and reacted differently from similar institutions or the national norm.

Using national data also enables a researcher to explore a complex issue more fully than with institutional data alone. National data provides a more diverse pool of students, thus allowing a researcher to explore a wider range of relationships.

National data come in a variety of forms, from publications containing summary statistics on various types of students or institutions, to data bases containing information on individual students or institutions. The best source of student-level and institution-level data is the National Center for Education Statistics (NCES), a component of the Office of Educational Research and Improvement (OERI) of the U.S. Department of Education. Several of their readily available data bases containing information on how students finance their postsecondary education are described below. Further, information about the best sources of summary data is also included.

First, however, let us review some issues to consider before beginning a research project using national data. The *time* needed to investigate a research question using a national data base varies widely with the scope of the project, depth of the research question, and complexity of the data base employed. A publication such as the *Digest of Education Statistics* contains descriptive information on a variety of subjects, such as the growth in tuition and fees at six different institution types (designated by control and program length) over the past twenty years. By comparing the growth in tuition and fees at a single institution with this data, one could establish whether the institution has raised tuition and fees more, less, or about the same as the national average for all institutions of similar type. The time to complete the project is minimal.

The project can be made much more specific than simply looking at institutions of similar control and program length, however, by using NCES's Integrated Postsecondary Education Data System (IPEDS) data. Use of IPEDS data will allow comparison not only of tuition and fees but also each component of an institution's student budget with similar institutions in regard to control, program length, types of degrees offered, geographic region, accreditation status, or selectivity for admitting entering freshmen. The amount of time required to become familiar with the IPEDS data and complete the project is significantly greater than that required to look up figures in a publication.

The level of difficulty of a research project depends on the level of statistical sophistication employed. Are the researcher's skills sufficient to accomplish the particular research project alone? If not, what are the skills of staff, students, and graduate assistants? Will outside help be needed? Always explore the possibility of assistance from the campus institutional research office, both to acquire data and conduct analyses.

Be careful and specific in the wording of research questions. Gain as much information as possible about issues of interest as well as about the population involved in answering these questions.

Choose a data base that contains the correct population and asks the right questions. Carefully study the nature of the sample under examination—whether data were gathered from students, their parents, or the institutions the students attend. Language varies with interpretation, so look for surveys that are judicious in the specific wording of survey questions, with questions easily understandable by survey respondents. Finally, find out about the timing of surveys within the academic year; financial aid questions asked in October could have very different answers than those asked in May.

Choose a data base whose ease of administration matches available resources, both personnel and hardware/software. Data come in a variety of different forms, and research using national data can be conducted using a variety of different processes. Therefore, match your resources to the scope of your project.

National Center for Education Statistics[1]

The National Center for Education Statistics provides a wide range of data and information to the education community: elementary, secondary and postsecondary. The official purpose of NCES is stated in law: "The purpose of the Center shall be to collect, analyze, and disseminate statistics and other data related to education in the United States and in other nations." (Section 406[b] of the General Education Provisions Act, as amended [20 U.S.C. 1221e-1])

In the postsecondary education area, NCES conducts surveys of institutions, students, parents, faculty, former students, and other postsecondary participants. They provide publications based on their data, and the data itself, to researchers and other interested parties.

When NCES conducts a survey of individuals it guarantees the confidentiality of all responses, ensuring that the information will be used for statistical purposes only and that survey responses will not be used to identify individual respondents or make public their personal information. Thus, survey data containing individually identifiable information are offered in two forms: an unrestricted or public-use version and a restricted-use version.

The unrestricted version is offered in a Data Analysis System (DAS). The DAS includes selected variables on all survey respondents. Researchers choose variables to be compared in a cross-tabulation format, and the DAS analyzes the chosen variables to present the researcher with the resulting table. Further, the DAS will provide basic statistical information, such as standard errors and correlation matrices, for further statistical analysis of the fit and significance of the relationships between variables. This system is relatively easy to use and provides basic descriptive information about respondent characteristics.

If, however, one requires a more sophisticated statistical analysis, or a researcher needs to examine a subset of the data that cannot be separated by the variables presented in the DAS, a restricted-use data file can be obtained from NCES. Because the data contain individually identifiable information, there is a complicated application process resulting in a NCES licensing agreement. In order to insure data confidentiality and the individual's privacy, the researcher must submit a security plan guaranteeing that no one else will view the data, providing details of procedures to keep the data secure and guarded at all times, and agreeing to publish only statistical results which will not allow readers to identify any

individual in the data set. Once this process is complete and the license obtained, the entire data set is available to the researcher, including all variables on all respondents (although names, addresses, and social security numbers are never included in any release). The research possibilities are enormous.

Although available in other formats, the most frequently requested and most easily used medium for NCES data, both restricted and unrestricted DAS versions, is the compact disk (CD). Hardware requirements for both public-use and restricted data sets include a 386 personal computer and a CD-Reader. Spreadsheet software, such as Lotus or Quattro Pro, is helpful, but not necessary, for reading results of the DAS; statistical software, such as SAS or SPSS, is necessary for conducting statistical analyses of restricted-use data. The public-use DASs are available from the Government Printing Office for a nominal fee and the restricted-use file is available free of charge from NCES after the licensing process is complete. NCES also makes available both publications and DASs through the Internet.

Reports Published by NCES

Several NCES publications provide descriptive data that can answer general questions and provide a starting place for definition of more complex research questions. Two are published annually by NCES. The *Digest of Education Statistics* ("*Digest*") provides probably the most useful general summary of U.S. education statistics, containing information on all education levels from preprimary through graduate. First published in 1962, the *Digest* includes detailed tables containing the most recent data available about a topic as well as more general longitudinal tables containing annual data since the early 1960s.

The *Digest* includes data from a variety of sources, both government and private, with special emphasis on data collected by NCES. Some topics related to higher education include: postsecondary enrollments (type and control of institution, student attendance status, gender, and age), postsecondary faculty (number of positions and average salary by such factors as employment status and control and type of institution), degrees conferred (type of degree, type and control of institution, and major), student charges and student financial assistance (tuition and fees, and participation in various aid programs), and income and expenditures (current-fund revenue sources and current-fund expenditures).

> For example, Table 98 of the 1995 *Digest* provides longitudinal data, 1969-70 through 1994-95, on the number of high school graduates by gender, control of high school (public or private), and a comparison of high school graduates with the population of 17-year-olds. For example, the table shows that in 1994-95, 73.4% of the 17-year-old population had graduated from high school. Table 99 provides data on the number of high school graduates by state for selected years.

NCES also publishes annually *The Condition of Education* ("*Condition*"). Created in 1975, this publication features easily understandable statistical information on the status and progress of elementary, secondary, and postsecondary education in America. Tables containing data on postsecondary education focus on issues of educational attainment, education financing, enrollments, age of students, and persistence. Not as broad or inclusive as the *Digest*, *Condition* nevertheless contains detailed, easily accessible information for higher education researchers.[2]

National Data Resource Center (NDRC)

In addition to providing researchers with a wide variety of data and publication resources, NCES also provides a group of researchers to conduct analyses upon request. The NDRC was created by NCES to provide information about and analyses from data collected by NCES. All analyses conducted by NDRC are performed free of charge. In addition to requesting analyses from NDRC, a researcher may receive assistance in conducting an original research project on site at the NDRC offices. NDRC responds to requests for specific analyses and tabulations; provides assistance to on-site researchers; develops

standardized tables, graphics and detailed reports for education policy makers; and provides limited programming analysis and other support functions.

Currently, NDRC has access to data for ten studies maintained by NCES; more may be available in the future. Of those studies described later in the chapter, NDRC has access to the Integrated Postsecondary Education Data System (IPEDS), National Postsecondary Student Aid Study (NPSAS), High School and Beyond (HS&B), and National Education Longitudinal Study (NELS).

Anyone—teachers, researchers, policy makers, financial aid officers, or students—may make data analysis requests of NDRC. Specify the research question, data set, and relevant variables for analysis, and they will provide tables and reports. Requests should be carefully worded. For the most part, NDRC is staffed by an expert group of programmers who are not experts on financial aid policy or practice. Therefore, detailed information about the data set should be requested, and perhaps some frequency distributions or descriptive statistics about different variables under consideration for a particular project. Study these, and then request final tables or more sophisticated analyses.

When requesting an analysis or tabulation from NDRC, in addition to the researcher's name, address, and phone number, include the following: (1) the name and year of the data set containing the relevant information, (2) the specific survey within the data set which gathered the relevant information, (3) the populations of interest, (4) type of statistical analysis to be performed, and (5) the requested format of the final product. For example, to obtain information about the average debt levels of students attending four-year public institutions by race, submit the following request:

> Using institutional record data and student survey data from the 1989-90 National Postsecondary Student Aid Study, please examine students who attended four-year public institutions and calculate the following: (1) the percent of students in each racial group who borrowed a Stafford loan, (2) the percent of students in each racial group who borrowed any type of education loan, (3) a distribution of average Stafford debt by race, and (4) a distribution of average total debt by race. Please send the results on a 3½-inch diskette as well as a paper copy.

NDRC also could provide similar information on average debt levels for private non-profit or proprietary institutions, or by other student characteristics such as dependency status, year in school, or gender. Furthermore, they could provide information on average debt for individual programs such as Stafford, Perkins, PLUS, state-funded loan programs, or institution-funded loan programs, by individual student characteristics.

NCES Data Bases of Most Interest to Financial Aid Officers

Integrated Postsecondary Education Data System (IPEDS)

IPEDS is NCES's most inclusive postsecondary education data collection effort. IPEDS provides information on all institutions whose primary purpose is to provide postsecondary education. In 1986, IPEDS replaced the Higher Education General Information Survey (HEGIS), which only provided information on college-level institutions accredited by organizations designated by the U.S. Secretary of Education. HEGIS was restricted to *collegiate* postsecondary institutions, while IPEDS includes all postsecondary institutions.

Information is published in various forms from each survey as the data become available. These publications include both data from the most recent IPEDS and trend data from previous surveys. Further, IPEDS data are used in the production of State Higher Education Profiles, which include data by state and by institution type.

IPEDS annually collects data from approximately 11,000 postsecondary institutions divided into nine categories. First, they are separated by program length: baccalaureate or higher degree-granting institutions, institutions offering programs between two and four years in length, and institutions offering less-than-two-year programs. Institutions are also divided by control: public, private not-for-profit, and private for-profit.

IPEDS contains the following components, all of which are collected annually unless otherwise specified. Each component is available separately via diskette or magnetic tape, while all components are available on CD.[3]

Institutional Characteristics: Data include variables such as the institution's address and congressional district, levels of degrees and awards offered, types of programs, accreditation status, calendar system (quarter, semester, etc.), information considered for selection of entering freshmen (high school diploma or equivalent, high school grades, admissions test scores, evidence of ability to benefit from instruction, etc.). Typical tuition and fee charges are included by undergraduate/graduate status and in-district/in-state/out-of-state status. Also included are average full-time undergraduate expenditures for books and supplies, transportation, room and board, and miscellaneous expenses.

Fall Enrollment: Number of full-time and part-time as well as undergraduate and graduate students can be stratified by gender, racial/ethnic category, age (odd-numbered years only), and residency status (even-numbered years only). Some information on enrollment in occupationally specific programs by sex and race/ethnicity is available in odd-numbered years.

Completions: Number of formal degrees awarded by various demographic characteristics such as gender and race/ethnicity. Formal degrees include associate, bachelor's, master's, doctoral, first professional, and other formal awards conferred by the institution.

Salaries, Tenure, and Fringe Benefits of Full-Time Instructional Faculty: Demographic characteristics, tenure status, salary, and fringe benefits information of full-time instructional faculty.

Financial Statistics: Current revenues by source and current expenditures by function. Revenue section contains information on total tuition and fees received by the institution. Expenditure section contains data on total revenues from scholarship and fellowship awards made by the institution. Scholarship awards are divided by source: Pell Grants, other federal grants, state grants, local government grants, private grants, and institutional grants.

College and University Libraries: Number of branches, number and salaries of full-time equivalent staff, and nature of book collections.

Fall Staff: Demographic data on institutional staff are collected in odd-numbered years.

Best used for descriptive reports and institutional comparisons, IPEDS can be used to analyze any of the following topics: summary statistics on all postsecondary students or categories of students such as undergraduates, graduates or first-time freshmen, by various demographic characteristics; status of vocational education programs; completions by type of program or level of award; which institutions are granting which degrees; and enrollment information by race.

Example: An appropriate use of IPEDS data would include producing tuition and fees and/or total cost of attendance information by control of institution, length of program, undergraduate/graduate students,

the specific type of calendar system of the institution, or region of the country. Specifically, IPEDS would allow an aid administrator at a private non-profit two-year college in New England to compare his or her institution's tuition and fees to the average tuition and fees for all other private non-profit two-year colleges in New England.

National Postsecondary Student Aid Study (NPSAS)

A comprehensive national study of students enrolled in postsecondary education, NPSAS collects data from students, their parents, and the postsecondary institutions where the students are enrolled. Detailed data on participation in student financial aid programs are taken from institutional records, then verified and augmented by student interviews. Begun in 1986-87, NPSAS is conducted every three or four years, depending on funding availability.

Each NPSAS data set contains data from three sources: institutions, students, and parents. Institutions provide mainly educational and financial information, such as grade point average, major field of study, year in school, and attendance status. Financial data provided by institutions include information such as expected family contribution for aided students, financial aid awards, and cost of attendance.

Some of the information provided by the institution—level, major field of study, and age—is also recorded via the student interview. Students also are asked to provide information not available from institutional records, such as race, financial aid at other schools attended during the survey year, reasons for selecting the school attended, marital status, employment status, and current income.

The parental interview includes questions about their child's postsecondary participation and methods of financing their child's education. Questions include parents' marital status, highest level of education achieved, income, amount of financial support provided to their child, and number and type of parent education loans.

NPSAS samples geographic areas, institutions within geographic areas, and students within institutions. The result is a nationally representative sample of all postsecondary students enrolled during the survey period. The 1986-87 NPSAS sampled only students enrolled in the fall of 1986. However, for the 1989-90 NPSAS, students enrolled at any time within the 1989-90 academic year were eligible for the study. The 1989-90 pattern was continued in 1992-93 and subsequently, to allow for estimates of full-year financial aid awards.

Because NPSAS includes detailed data relating to student education financing as well as demographic and descriptive information on postsecondary students, their parents, and the institutions the students attend, many topics can be explored using this data source. NPSAS can be used to analyze student participation in individual financial aid programs, in different combinations of programs, and in different combinations of aid type. NPSAS can also be used to relate institutional, student, and family characteristics to program participation. Financing issues of special populations of students—defined by such characteristics as dependency status, race, or family income level—can be assessed.

Example: NPSAS could be used to assess different levels of institutional awards provided to various types of students by various types of institutions. Using information provided by the institution and the student, one could easily assess the varying levels of institutional money given in the form of grants, need-based or non-need-based scholarships, loans, or work-study. Further, this information could be broken down by various student characteristics such as family income level, dependency status, grade point average, or race. For example, NPSAS could be used to calculate the average institutional grant awarded to minority students at private non-profit four-year institutions. An aid administrator at a private non-profit four-year institution could compare the national average institutional grant awarded

to minority students to the average institutional grant awarded to minority students at his or her institution.

Another use for NPSAS would be the calculation of the percentage of students who receive financial aid by various student or institutional characteristics. For instance, an aid administrator could calculate the percentage of full-time and part-time students at public four-year doctoral granting universities who receive any financial aid, who receive grants, and who receive education loans. These results could be compared with the percentage of full-time and part-time students at the institution who receive grants and who receive education loans.

For comparative purposes, NPSAS includes students who do not receive financial aid as well as those who do, graduate as well as undergraduate students, independent or non-traditional students as well as dependent or traditional student populations, and students attending traditional collegiate institutions as well as those attending vocational institutions.

Following each NPSAS survey, NCES publishes three major reports, *Undergraduate Financing of Postsecondary Education*, *Student Financing of Graduate and Professional Education*, and *Profile of Undergraduates in American Postsecondary Institutions*. These publications contain a wealth of basic descriptive statistics, serving as both a valuable information resource and an effective introduction to the data's scope and capabilities. These publications alone can answer many research questions or serve as a beginning for further exploration.

Beginning Postsecondary Student Longitudinal Study (BPS)

BPS gathers longitudinal data on a cohort of students who entered a postsecondary education program in 1989-90. Because increasing numbers of older students are beginning their postsecondary education many years after high school, high school cohorts that are followed through postsecondary education are no longer representative of the entire postsecondary population. Thus, BPS includes both the "traditional" college student population—those who entered a postsecondary program immediately following high school graduation—and the "nontraditional" population—those who started their formal postsecondary education later in life. The result is a nationally representative longitudinal sample of students who entered postsecondary education during the same year.

BPS provides the necessary data to assess persistence from initial entry into postsecondary education through completion or dropout, and transitions from postsecondary education into the world of work. BPS also allows researchers to address transition issues between undergraduate and graduate postsecondary education and between each of these and work. Other possible topics include: access to graduate school, postsecondary outcomes, and rates of return of higher education.

Example: BPS currently allows examination of persistence rates between the first and third year of postsecondary education. An aid administrator could calculate the portion of aided minority students and non-aided minority students attending public four-year institutions in the base-year who were still attending the same institution two years later.

BPS allows the comparison of the persistence/completion rates of students who began postsecondary education immediately following high school to those of students who began later. It is also possible to use BPS to assess the effects of the intervening activities, between high school and postsecondary education, of those students beginning postsecondary education later in life.

BPS is based on the National Postsecondary Student Aid Study of 1989-90, and will follow these students, collecting additional data every two to three years. For the base year, data were collected via NPSAS from students, their parents, and institutional records. Student data were collected subsequently in

1992 and 1994. Students were asked about their current year in school and related academic progress, education-related experiences, current family status, postsecondary expenses and financial aid, employment status and current year income, employment-related training other than formal education, involvement in community service, graduate school plans, and future plans.

BPS also collected postsecondary transcripts and financial aid records covering the entire undergraduate period to provide complete information on progress and persistence. Additional BPS base-year cohorts will be selected from alternating NPSAS surveys, every six to eight years. The next BPS base-year cohort will be collected as part of the 1996-97 NPSAS.

A descriptive report is published by NCES after each BPS follow-up, containing a wealth of general descriptive information about the survey population, although little detail.

Baccalaureate and Beyond Longitudinal Study (B&B)

B&B provides data on the education and employment experiences of individuals holding bachelor's degrees. This study attempts to collect postsecondary education data on students in the final stages of a baccalaureate degree and to follow those students into a graduate program or into the world of work. B&B is uniquely suited to study the issues surrounding graduate education such as delayed entry and reasons for entry into graduate programs, time to completion for various graduate degrees, and interactions between graduate education and work.

The B&B sample includes individuals who completed their baccalaureate degrees during the 1992-93 academic year, and will follow these students for twelve years. As the surveys are continued, B&B will provide detailed information on graduate school experiences, work force experiences, and even unemployment experiences of individuals holding bachelor's degrees.

The B&B cohort is drawn from the National Postsecondary Student Aid Study of 1992-93. Thus, base-year data for B&B include all baccalaureate degree recipients from the 1992-93 NPSAS. B&B will follow these students for twelve years, collecting additional data one, three, six, nine, and twelve years after college completion. (Additional B&B base-year cohorts will be selected from alternating NPSAS surveys, thus every six to eight years.)

For the base year, data were collected from students, their parents, and institutional records. Following the base year, students will be surveyed every two years. Students will be asked to provide information about their education experiences: entry into graduate school, persistence and periods of attendance, graduate loan burden, academic progress, change in field of study, financial aid, and current family status. Information also will be requested about employment and other experiences: entry into the work force, employment-related training, entry and persistence in teaching, community service, political participation, and future expectations.

Like BPS, B&B will collect postsecondary transcripts covering the entire undergraduate period to provide complete information on progress and persistence. Undergraduate transcripts will be collected during the 1994-95 academic year and graduate transcripts will be collected about six years later.

In the first round of B&B, special emphasis will be given to students entering service areas, particularly teaching. This emphasis will allow researchers to examine the longitudinal perspective of the graduate education/work interaction concerning newly qualified teachers and their entry into and continuation in the field of education.

B&B data will allow researchers to study entry into and progress through graduate school as well as entry and experiences in the work force. The interaction between employment experiences and graduate school is another important topic which can be readily addressed by this data base. Other topics include access to graduate school, rates of return from baccalaureate degrees, and various ways of financing graduate education.

Example: Researchers will be able to look at the portion of baccalaureate graduates from public and private non-profit institutions who enrolled in graduate school immediately following graduation. Also, one could calculate the rate at which students who borrowed to finance their undergraduate education enrolled in graduate school immediately following graduation as opposed to students who did not borrow any education loans as undergraduates.

A descriptive report will be published by NCES after each B&B follow-up. Like the BPS report, this report will contain a wealth of general descriptive data about the survey population but little specific detail. The first follow-up of B&B will also include a special report on teachers and will be available in spring/summer 1996.

High School and Beyond (HS&B)

Begun in 1980, HS&B was the second longitudinal study conducted by NCES. Drawing two base-year samples, one of sophomores and one of seniors, HS&B was able to address issues of importance to secondary education as well as postsecondary education. Data from the sophomore cohort made possible the study of issues pertaining to (1) changes and processes which take place during high school and (2) high school dropouts. Data from the senior cohort allowed the study of access to and experiences within postsecondary education, both collegiate and vocational. Data were collected from schools, students, and parents, and follow-up surveys were conducted in two year intervals (1982, 1984, 1986), with a final follow-up of the sophomore cohort in 1992.

Data were collected in the base year using six different instruments. First, sophomore and senior students provided information about themselves, their families, high school experiences, work experiences, and future plans. Students also completed a series of cognitive tests that measured verbal and quantitative abilities. A sample of parents answered questions about how family attitudes and financial planning affected educational goals. School administrators provided data about enrollment, staff, educational programs, facilities and services, dropout rates, and special programs for disadvantaged students. Teachers of the sampled students provided observations of these students.

Follow-up surveys of the sophomore cohort were similar to the base-year questions, additionally collecting high school transcripts and detailed data on students who dropped out. In addition to base-year data, follow-up surveys of the senior cohort asked about marital status, community involvement, work plans, education attainment, type of financial aid for postsecondary education, and postsecondary transcripts.

Data from the sophomore cohort provide insights into the high school dropout problem and into the influence of the last two years of high school on student attitudes and aspirations. Follow-up data allow researchers to trace the consequences of dropping out and the extent to which dropouts later return and complete high school.

Data from the senior cohort provide an excellent opportunity to study the various influences on young people as they move from high school into postsecondary education or the workforce, both the outcomes and the intervening processes which later influence outcomes. Specifically, one can examine the role of family finances and the availability of financial aid on the decision to pursue postsecondary education and the choice of a postsecondary institution.

Example: HS&B sophomore cohort could be used to calculate the portion of high school dropouts who eventually completed high school or a high school equivalency, the portion who enrolled in a postsecondary institution, and the portion who enrolled in each type of postsecondary institution: public, private non-profit, or proprietary.

National Education Longitudinal Study of 1988 (NELS)

In 1988, NELS gathered data on a nationally representative group of eighth graders. Since 1988, follow-up surveys have been administered to the same group (1990, 1992 and 1994). The NELS sample first selected schools (public and private) and then students within schools. Data were collected from approximately 25,000 eighth graders, their parents, their teachers, and their school principals. Students also took cognitive tests in reading, science, history/government, and math to provide both a look at eighth-grade coursework and a base-year measure of academic achievement.

In the First Follow-up Survey, conducted in 1990, NELS once again collected information from students, their teachers, and a school administrator. In addition, a special questionnaire was developed for students who had dropped out of school. Students were once again asked to take cognitive tests in the four course areas. These tests were designed to measure not only tenth grade coursework, but also to measure academic growth between the eighth and tenth grades.

The Second Follow-up Survey was conducted during the spring of 1992, once again gathering information from students, teachers, school administrators, and parents (as in the base-year survey), and distributing dropout questionnaires. Students and dropouts were asked to take cognitive tests in reading, science, social science, and math. Additionally, NELS Second Follow-up included a School Effects Supplement which asked for information from additional students and teachers in 250 of the NELS schools.

In the base year, students answered questions about their family backgrounds, in- and out-of-school activities, educational and occupational goals, perceptions about self and school, self-reported grades, and the nature of their relationship with their parents, especially regarding decision making. The First Follow-up asked students to provide information about intervening school experiences and activities, plans for the future, and opinions about themselves. The Second Follow-up added information such as social development, opinions about self, occupational expectations, money, and work.

In the base-year survey, parents provided information about their participation in secondary and postsecondary education planning, socioeconomic status, and family educational expenses. In the Second Follow-up, parents updated information from the base-year questionnaire and answered additional questions about their involvement in their child's future education and employment plans.

Three types of information were collected from school administrators: data on school characteristics such as school type, enrollment, grades, admission procedures and tuition, grading, testing, activities, and the school's academic and social environment; data on student characteristics such as race/ethnicity, average daily attendance, and special student services used such as remedial classes; and data on teaching staff characteristics such as size, race/ethnicity, salary, and degree. The First Follow-up updated information on school characteristics, student characteristics, and teaching staff characteristics. Further, a new section gathered information on school admission policies and practices, with detailed information on grading, testing, school programs, and school climate. In the Second Follow-up, data again were collected on school, student, and teacher staff characteristics.

Three types of information were collected from teachers: information about student characteristics such as personal information, behavior, grades, and attitudes; class information such as curriculum, homework assignments, use of instructional materials, and textbooks; and teacher information such as sex, race/ethnicity, age, experience, certification, degree, and parent contact. Similar information was collected in each of the two follow-up questionnaires.

In the special surveys for students who had dropped out of high school before receiving a degree, students were asked about their plans for the future, opinions about themselves, family composition, reasons for leaving school, their grade at the time they left, peer group support, and if they had returned or planned to return in the future.

NELS provides data about how young people handle critical transitions as they grow, attend school, and begin their careers. It will furnish new information on how school policies, teacher practices, and family involvement affect student educational outcomes such as academic achievement, persistence in school, and participation in postsecondary education.

Other Reports of Interest to Financial Aid Officers

Sources other than NCES also provide statistical reports which include valuable information one can use to either answer general questions or provide the background for a detailed analysis of an issue.

The American Freshman: National Norms for Fall is published annually by the American Council on Education and the Graduate School of Education at the University of California, Los Angeles. Descriptive characteristics of first-time, full-time freshmen are weighted to provide a normative profile of the American freshman population. Descriptive characteristics include age, race, average high school grade, parental income, number of colleges applied to for admission, highest degree planned to obtain, religious preference, and probable career occupation. All characteristics are presented by type of institution and gender.

Example: An aid administrator at a private university concerned about the number of admission applications each freshman submitted before deciding to attend their university could find out that in 1993, 9.1% of freshmen at private universities applied to only one institution, 21.8% applied to either two or three institutions, 31% applied to either four or five institutions, and 38.1% applied to more than five institutions.

In addition to the annual freshman survey, a follow-up of a portion of each group of freshmen is conducted two and four years after college entry. The results of these follow-up studies are also published regularly by the Higher Education Research Institute.

Campus Trends, published annually by the American Council on Education, contains the results of an annual survey focusing on changes in the academic and administrative practices of American colleges and universities. Each spring, a representative sample of college and university administrators from institutions offering general programs of undergraduate instruction are asked to complete and return surveys. The surveys are specifically designed to obtain information on changes affecting institutions, focusing on special emphasis issues in individual years. Standard issues for discussion include changes in enrollment, curriculum, faculty hiring, and assessment activities. Specific issues receiving special consideration in recent years include financial circumstances facing American higher education (1992) and events or circumstances causing substantial changes in American colleges and universities (1993).

Example: Figure 5 of the 1993 edition of *Campus Trends* includes the percentage of institutions with enrollment increases by region. The figure shows that in the northeast region, public two-year institution enrollments increased by 94%, public four-year enrollments increased by 31%, and independent enrollments increased by 50%.

The National Association of State Student Grant and Aid Programs Annual Survey Report presents detailed data on state scholarship and grant expenditures each academic year, and selected comparisons of current levels with past years. This publication includes results of an annual survey of state grant agencies conducted by the New York Higher Education Service Corporation. (Formerly, the report was conducted by the Pennsylvania Higher Education Assistance Agency.) The report contains a wealth of information on specific state programs, both need-based and non-need-based, including estimated total grant aid awarded by state programs, number of awards and dollars awarded to undergraduates and

graduate/professional students, SSIG activities, and comments on various state and national policies that affect state grant awards in individual states.

Example: Table 2 of the 1992-93 report provides the average undergraduate need-based grant amount for each individual state. For example, in 1992-93, Virginia's two state scholarship and grant programs provided 8,900 need-based grants to undergraduates. The average grant amount for Virginia was $748. Likewise, Pennsylvania's two programs provided 126,751 need-based grants to undergraduates with an average grant amount of $1,367.

Trends in Student Aid, published annually by The Washington Office of The College Board, offers data on the amount of financial assistance available to help students pay for postsecondary education. It provides comparative statistics over time on the major providers of student aid: the federal government, state governments, and institutions. Data represent virtually all federal aid and the majority of state and institutional assistance available to students in postsecondary education. To encourage consistent interpretation of trends, all data are reported in constant (adjusted for inflation) dollars, as well as in current dollars. Data on the cost of attendance and family incomes also are included.

Example: In addition to providing the total amount of dollars provided by specific programs, information is presented on the total number of awards and the average award amount from the eight largest programs covered by the publication. For example, in 1994-95, the Federal Subsidized Stafford Loan Program lent a total of $13.9 billion through the FFEL Program and $1.1 billion through the Ford Direct Student Loan Program. The average loan borrowed through the FFEL Subsidized Stafford Program was $3,313, and the average loan borrowed through the Ford Direct Subsidized Stafford Program was $3,701. Likewise, the Federal Pell Grant Program awarded about $5.6 billion to about 3.7 million students in 1994-95. The average Pell Grant for 1994-95 was $1,520.

Chapter 6 Notes

1. NCES and Department of Education publications can be obtained from the U.S. Government Printing Office Superintendent of Documents by writing: New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 or calling 202-512-1800. For further information on NCES statistics and publications, contact OERI's Education Information Office at the following address:

   OERI Education Information Office
   Capitol Place Building
   555 New Jersey Avenue, N.W.
   Washington, D.C. 20208
   Telephone: 800-424-1616

   To request analyses or information from the National Data Resource Center, send requests to the following address:

   National Center for Education Statistics
   Attention: NDRC
   555 New Jersey Avenue, N.W.
   Washington, D.C. 20208-5651
   Telephone: 202-219-1611
   Fax: 202-219-1728

   The Internet addresses for the NCES data sets discussed in this chapter are as follows:

homepage	http://www.ed.gov/NCES/
IPEDS	http://www.ed.gov/NCES/ipeds/index.html
NPSAS	http://www.ed.gov/NCES/surveys/npsas.html
BPS	http://www.ed.gov/NCES/surveys/bps.html
B&B	http://www.ed.gov/NCES/surveys/b&b.html
HS&B	http://www.ed.gov/NCES/surveys/hsb.html
NELS	http://www.ed.gov/NCES/surveys/nels88.html

2. Information on starting salaries of college graduates by major field of study is found on pages 88-89 of the 1993 edition of *Condition. Condition* illustrates whether the median salary for college graduates of six different major fields of study is above or below the median starting salary for all college graduates during selected years. For example, in 1990, students majoring in computer science and engineering or business earned a higher median starting salary than that of all college graduates, and students majoring in humanities, social and behavioral sciences, natural sciences, and education earned a lower median starting salary than that of all college graduates.

3. The variables listed below provide examples of specific variables or categories of variables found in each IPEDS component, but do not include all specific variables in the data set. This is true for all data sets described in this chapter.

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CHAPTER 7

Assessing the Impact of Student Financial Aid on First-Time Enrollment Decisions

Edward P. St. John and Patricia Somers

Most theorists and researchers interested in student-choice behavior believe that student aid has a positive direct effect on student decisions to enroll in college, even if they have doubts about whether student aid has an influence on persistence (*e.g.*, Pascarella and Terenzini 1991). This is good news for financial aid administrators, because lack of doubt about the effectiveness of aid in promoting access usually means that the role of the student aid office in enrollment is relatively secure. However, there is also a near void in institutional-specific research on the effects of student aid on student first-time enrollment behavior; most colleges lack information about the effectiveness of their financial aid strategies.

The principal reason for this ambiguous situation is that a substantial number of national studies have found a positive association between student aid and first-time enrollment (*e.g.*, Jackson 1978, 1988), but until recently there have been few institutional studies. As a result there is a general belief that student aid is effective in promoting access, but little local knowledge about whether particular strategies are working the way they are intended. Instead, admissions officers and financial aid administrators either use anecdotes or information on trends in the yield of admitted applicants to justify their claims that their strategies are working.

New developments in student aid research have given financial aid administrators research tools to assess the impact of the aid strategies being used on campus. A workable assessment model for institutional research has been proposed (St. John 1991) and tested (Somers 1992; Somers and St. John 1993, 1994). This opens the door for a new generation of institutional research on the effects of student financial aid.

This chapter describes a model for assessing the effects of student aid on first-time enrollment (adapted from St. John 1992) with illustrations of how it has been used in institutional research (adapted from Somers and St. John 1993). In addition, technical issues related to conducting and interpreting institutional research on the effects of financial aid are discussed in a set of appendices.

A Workable Model

To be workable—that is, to be of practical use in assessing institutional aid strategies—a model must meet five criteria:

1. It must include the various factors, in addition to student aid, that influence student enrollment decisions.

2. It must be possible to develop and test the model using existing institutional data sources; otherwise the research will not be widely undertaken.

3. It must be possible to conduct the research using appropriate statistical methods under conditions that are prevalent in most colleges and universities.

4. There must be sufficient information on each of the various factors in the logical model so that the influence of student aid can be measured.

5. The results must be useful to institutional administrators.

St. John (1992) proposed a model for institutional research on first-time enrollment that meets these criteria. The logic of the model and a recommended set of statistical methods are described below and in the appendices to this chapter.

The Logical Model

It is appropriate that institutional research on the effects of student aid be grounded in economic theory on student demand and sociological theory on educational attainment. The early student-demand studies demonstrated a relationship between institutional prices and student-enrollment decisions (Jackson and Weathersby 1975), but they were criticized for not controlling for other variables that could influence student decisions (Dresch 1975). Sociological research on educational attainment (*e.g.*, Alexander and Eckland 1975) provided a foundation for examining the linkages between students' backgrounds and their educational decisions, but did not consider the role of institutional characteristics or actions, which is necessary for research on the effects of student aid.

Based on reviews of these lines of inquiry, some models were developed for assessing the effects of student aid by using national data bases (Jackson 1978, 1988; St. John 1991; St. John and Noell 1989). These models were used as the basis for the logical model described here.

It is appropriate to consider accepted applicants when conducting institutional research on first-time enrollment, since this is the population most directly influenced by institutional pricing policies—tuition charges and student aid allocations and packaging. (While the decisions of prospective students to apply to a particular college are influenced also by the sticker price and the information they see about student aid availability, these indirect effects of student aid are beyond the parameters of the model presented here.) This model views *first-time enrollment* as a dichotomous outcome—either accepted applicants attend or they do not. Decisions by accepted applicants to enroll in college are appropriately viewed as a function of social background, academic preparation, and student aid (or price). The types of variables related to each factor that should be considered in the model are described briefly below (and are further specified in Appendix A).

Social background typically includes such variables as age, ethnicity, gender, income, parents' education, marital status, and dependency status. Such data, with the exception of parental income and education, are routinely collected as part of the admissions process. We do not consider the absence of information on parental education to be a serious problem, since parental education is not likely to interact with student aid (St. John, Andrieu, Oescher, and Starkey, in press).[1] However, income is considered critical, because the receipt of aid and the amount received are related to family income. Income variables can be created from financial aid records for aid applicants and transformed into a set of design variables for all students (using the method described in Appendix B).

Decisions about which background variables to include depend on the characteristics of the population of accepted applicants. For example, while it is desirable to control for age if the analysis is for a large public college with a diverse student population, it may not be necessary to include an age variable at a private college that targets high school seniors for recruitment. In the latter case, there might not be sufficient variation for an age variable to converge or matter. We recommend that ethnicity be considered; however, if there is an insufficient number of minority group members in the accepted-applicant population, it may not be possible to use this variable.

Academic preparation typically includes high school grades and academic track, test scores, and aspirations. Whether any of these variables are routinely collected depends on an institution's admissions process. At a minimum, either high school grades or standardized test scores are recommended. These are

typically highly correlated (Terkla and Jackson 1984) and, therefore, one of these measures is adequate. Usually an institution will collect one or two of these measures as part of the admissions process, which means they can be used in the model. If this information is not available, then analysis of first-time enrollment cannot include these variables. The model will still measure the direct effects of student aid, but since enrollment decisions probably are influenced by the unmeasured academic variables, the overall quality of the model is diminished. In this case, institutional researchers may want to concentrate on assessing the effects of aid on persistence.

Research consistently shows that student aspirations have an effect on first-time enrollment (St. John and Noell 1989). Unfortunately, many institutions do not routinely collect information on student educational aspirations. If it is not possible to consider aspirations, this void will not cause substantial problems as long as other variables related to academic preparation are considered.

The model assesses the effect of student aid by focusing on aid offers. The student record for aid programs should include the type and amount of each type of aid. This enables the researcher to investigate the effects of aid packages and aid amounts. Four approaches to assessing the effects of aid offers—the receipt of an aid offer, the amount of aid offered, the amount of different types of aid offered, and the type of aid package offered—are specified in Appendix A.

Data Sources

The information related to each of these factors generally is available from existing institutional data sources. The student aid office maintains information on financial aid offers made to applicants. Student aid records also contain needed information on income and dependency status and on financial aid and aid packages.

Admissions records are necessary for information on social background (ethnicity, gender, age, etc.) and academic preparation (test scores, grades, etc.). Appropriate data elements should be drawn from admissions records before they are sent to archives.

Information from student records systems is also needed, especially for analyses of persistence. For the first-time enrollment model, whether the applicant actually enrolled is all that is necessary.

In most institutions, it is desirable to examine the entire applicant population and to follow all admitted students through the matriculation process. Even a population of 20,000 can easily be examined on a mainframe computer. There are very few, if any, institutions in the country that have more than this number of accepted first-time applicants. Thus, the complexities of selecting a sample can be avoided in virtually all types of colleges and universities. Specifically, the issue of having adequate numbers of minority applicants needs to be considered when samples are used, which can mean that stratified samples may be needed. When stratified samples are used, then the samples need to be weighted, which increases the complexity of a study.

Statistical Methods

Recommendations on statistical methods for research on enrollment decisions are based on two considerations: (1) that college and university administrators are concerned about probabilities that accepted applicants will enroll and actions that positively influence those probabilities; and (2) that statistical methods are simple enough that research can easily be executed.

Based on these considerations, two specific statistical procedures are recommended. First, logit or probit regressions are appropriate for analyses of qualitative outcomes, such as the decision to attend college (Aldrich and Nelson 1984). This approach provides administrators with practical information about how aid strategies influence enrollment probabilities, a "theoretical advantage" associated with these techniques (Dey and Astin 1993). Both logistic and probit regression procedures are standard

options in mainframe statistical packages such as SAS or SPSS. (In fact, this procedure is an option in some statistical packages available for personal computers.) Therefore, the recommended procedure can be implemented at most institutions with few difficulties. The results of logistic and probit analyses are similar (Aldrich and Nelson 1984) and the choice between them depends on the researcher's preference, as well as the capabilities of the particular software package used. The logit and probit models make it possible to construct the sets of design variables needed to assess the effects of income (Appendix B), which means there is a practical advantage to using them.

Second, it is recommended that a procedure be used to convert the logistic (or probit) betas (provided in the computer printout) for each independent variable to change probability measures (delta-p statistics).

A "beta" is the coefficient for the independent variables in the regression equation (*e.g.*, in $y = a + bx$, the y is outcome [*e.g.*, first-time enrollment], a is a constant, b is the beta, and x is an independent variable [*e.g.*, the receipt of student aid]). Delta-p statistics (discussed in Appendix C) can be interpreted as a percentage point change in the outcome attributable to the independent variable. For a dichotomous variable with a significant beta, a delta-p of 0.05, say for being African-American, means that having that characteristic increases the probability of enrolling by five percentage points (compared to those in the uncoded group).

In combination, these two statistical procedures will make it possible to use price-response measures for student aid variables, if they are properly specified and meaningfully different (statistically significant).

It should be noted that measures of statistical significance for independent variables do not have to be used when the whole population is being examined. Keep in mind that when significance tests are used on a sample population, a significant beta coefficient indicates the observed difference is due to a real difference rather than to chance. Since we have already recommended that the entire population be examined, significance tests *do not have to be presented*. However, we recommend that *they still be used* as they continue to inform the researcher when differences indicated by beta coefficients are meaningful. A significance level of 0.05 is generally used as the minimum standard, although arguments can be made for smaller (0.01) or larger (0.1) levels of significance.

The rules governing the use of logistic and probit models should be closely followed (*e.g.*, Aldrich and Nelson 1984; Hosmer and Lemeshow 1989). Given the fact that institutional data sources probably will not contain all the information that would be necessary for a perfect model, the researcher should include an appropriate variable (or variables) related to each factor. For example, the lack of availability of income data for non-aid applicants needs to be readily acknowledged, in spite of the recommended procedures for controlling for this deficiency (Appendix B). The fact is that most quantitative research includes imperfect data. The goal of the researcher is to create strategies for developing the best possible model, given the data constraints.

An Example

An example of a first-time enrollment analysis in an urban public university (adapted from Somers and St. John 1993) is presented in Table 7-1 to illustrate the use of the proposed model.[2] The subject university was located in a major urban center, in a state with a pending court order to desegregate the public higher education system. The university had made a substantial investment in a merit-based grant program for National Merit finalists, but had not invested any of its own money in need-based aid. The model described above was used, with two slight modifications. First, additional variables were created to assess the effects of the merit-based aid program: National Merit finalists were separately examined, and merit aid was separately examined in one of the three analyses. Second, information on aspirations was

not available. The variable descriptions and descriptive statistics for the independent variables are presented in Appendix D. The first analysis considers the effects of recurring aid, the second considers the effects of aid amounts received, and the third considers the effects of the amounts of four different types of student aid. In all three analyses, enrollment by an admitted student is the dependent variable.

The first analysis examined the influence of the receipt of any aid on first-time enrollment. African-American applicants were 22.6 percentage points *less* likely than other ethnic groups (excluding Hispanics) to attend.[3] This indicated that the institution was not attracting admitted African-American applicants, a situation that could be considered problematic given the pending court order to desegregate public higher education in the state. However, middle-income aid applicants also were 19.4 percentage points *less* likely than non-aid applicants to enroll.[4] This suggested that the university was not competing well for middle-income applicants. We suspect this was because middle-income applicants did not receive a sufficient amount of aid. We reach this conclusion because this variable is no longer significant when the effect of the amount of aid offered is considered (Version 2, Table 7-1.).

Additionally, this analysis demonstrated the potential of institutional aid in attracting applicants. The National Merit Scholars,[5] who all received scholarships, were 26 percentage points *more* likely to attend. However, applicants who were high scorers on the ACT (but were not National Merit finalists) and who probably received only need-based aid awards (if they received aid offers) were about 22 percentage points *less* likely to attend.

Finally, the analysis indicates that aid offers were effective at this institution. The receipt of an aid offer was significantly and positively associated with first-time enrollment. Receiving aid increased the probability that the average accepted applicant would enroll by about 23 percentage points.

The second version, which contained the variable "total aid," showed the effect of the amount of aid on first-time enrollment, with the total amount of aid significantly associated with an increase in first-time enrollment. In this analysis, aid applicants from low- and high-income groups were more likely to attend; however, independence was significantly and negatively associated with first-time enrollment. Further, middle-income aid applicants were no longer less likely to enroll. This indicates that the reason for the negative coefficient for this variable in the first model was related to the *amounts* of aid students were offered. This model also provides a price-response measure: the average accepted applicant was 6.2 percentage points *more* likely to enroll per $1,000 in aid awarded.[6] This measure can be interpreted as a price-response measure.[7]

In the third model, the impact of each type of aid offered was examined. Only scholarships were significantly associated with first-time enrollment. However, the power of scholarship money in attracting well-qualified applicants was demonstrated by the large price response: *applicants awarded scholarships were 23.6 percentage points more likely to enroll for each $1,000 of aid awarded.* However, high scorers on the ACT who did not qualify for the special National Merit Scholarships were much *less* likely to enroll. The model statistics indicate that the discretionary aid awarded by the university accounts for the effectiveness of its aid strategy. In the third model, all three types of aid applicants were more likely than non-aid applicants to enroll.

This study offers two conclusions that merit consideration. First, we demonstrated that it is possible to develop workable models for assessing the effects of student aid while using extant data sources. This approach is a viable way to assess the effects of financial aid strategies by using existing data and simple statistical procedures.

These findings suggest that institutional research on the effect of student aid on first-time enrollment represents a viable way of linking financial aid packaging decisions to other enrollment-management strategies. An institutional research program can help colleges make informed choices about whether to invest in student financial aid, where to invest those funds, and how much to invest. For example, the aid strategy used by the public urban university attracted National Merit Scholars, but apparently lost African-Americans and middle-income applicants who might have attended if these discretionary funds

were redistributed. We reach this conclusion based on the negative coefficients for these variables in the analyses (especially Version 1, Table 7-1). The analysis of first-to-second-year persistence (Somers 1992) found that students who received large merit grants were less likely to return the second year. This finding raised the question about whether the aid could have been better used. The institution subsequently implemented another strategy for merit aid.

Second, this study suggests that the institutional investment of discretionary resources in student aid increases the effectiveness of aid offers. We reached this conclusion because the merit scholarship funds at this university explained why the amount of aid offered was positively associated with persistence (compare Version 3 to Versions 1 and 2). Typically public colleges and universities do not invest their own resources in student aid. However, this particular public university made a substantial investment of its discretionary resources in scholarships, which seems to be the reason why aid was viable. Given the decline in federal student aid in the 1980s (St. John 1993), it may be necessary for institutions to invest their own funds to maintain the effectiveness of student aid.

This second finding reinforced the conclusions of a recent national study of price response in persistence (St. John, Oescher, and Andrieu 1992): that combined grant and scholarship awards were positively associated with persistence by traditional college-age students in *private* four-year institutions but not *public* four-year institutions. This difference was attributed to the facts that: (1) private institutions invested more of their own discretionary resources in student aid than did public institutions, and (2) federal grants did not keep pace with tuition increases in the 1980s.

Conclusions

Conducting institutional research on the effects of financial aid awards on first-time enrollment can improve the strategic use of institutional resources. It can help build an understanding of the consequences of government-financing strategies for institutions and their prospective students, as well as of ways institutions can best contend with the potentially problematic consequences of federal student aid policies.

There are, of course, practical issues that may confront those who venture into research on the effects of aid strategies. They may need to adapt the basic model proposed above (Appendix A) to address questions of interest at the institution. For example, in the example presented here an adaptation was made to examine the effects of a merit scholarship program (compare Appendix D to Appendix A). Additional guidance on making adaptations to the model is provided in Appendix E. It is also possible that a study will reveal that the particular aid strategies being used are not working well. Some issues that researchers might want to consider when confronted by this circumstance are explored briefly in Appendix F.

In conclusion, the availability of a workable model opens the door for financial aid administrators and other institutional researchers to get more directly involved in institutional discourses about financing strategies. And when such studies are published, they can help build an understanding of the effects of different types of aid strategies.

TABLE 7-1. Comparison of Three Approaches to Assessing the Effects of Student Aid on First-Time Enrollment

Factor / Variable	Version 1 Any Aid Delta P	Version 2 Aid Amount Delta P	Version 3 Aid Types Delta P
Background			
Female	0.0077	0.0009	0.0065
African-American	-0.2261*	-0.2229*	-0.2086*
Hispanic	0.0672	0.0665	0.0672
Independent	-0.0922	-0.1243**	-0.0954
Low-income aid applicant	-0.0945	0.1031**	0.2119*
Middle-income aid applicant	-0.1944*	0.0656	0.1866*
High-income aid applicant	0.0101	0.1906*	0.2268*
Age	0.0033	0.0046**	0.0029
Achievement			
ACT - low	-0.0012	0.0020	-0.0013
ACT - high	-0.2177*	-0.1953*	-0.2289*
National Merit	0.2600*	0.2600	***
Financial aid			
Any aid?	0.2271*		
Total aid		0.0619*	
Aid Types			
Grant $			-0.0761
Loan $			-0.0340
Work study $			0.2599
Scholarship $			0.2355*

*Significance level = 0.01

**Significance level = 0.05

***Variable omitted because of the high correlation coefficient (.9) with scholarship $. National Merit finalists were coded as "ACT-high" in this analysis.

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APPENDIX A

Specifications for First-Time Enrollment Model

Factor/ Variable	Probable Data Source	Recommended Coding	Var. Type	Comments
Student ID	All Sources	NA	NA	Necessary to complete record from different sources
I. *Social Background*				
A. Gender	AD	Male=1 Female=0[1]	DI	Compares males to females
B. Age	AD	Years	N	Measures changes in probability of attending for each year of age
C. Ethnicity[2] Black	AD	Black=1 Other =0	DI	Compares Blacks to others (except Hispanics)
Hispanic	AD	Hispanic=1 Other=0		Compares Hispanics to others (exc. Blacks)
D. Dependency Status	SA	Independent=1 Others=0	DI	Controls for the interaction between dependency status and income
E. Financial Need[3] High need	SA	Low income=1 Others=0	DI	Compares high need applicants to all others (excluding other aid applicants).
Moderate need	SA	Lower-middle income=1 Others=0	DI	Compares moderate need aid applicants to other non-aid applicants
Low need[4]	SA	Upper-middle income=1 Others=0	DI	Compares low-need aid applicants to other non-aid applicants

[1]Reverse coding (female = 1, male = 0) equally viable.

[2]Recommend treating Black and Hispanic separately since these groups are historically under-represented in higher education.

[3]If the institution maintains information on all students in admissions or student records, then the source used for all students' income would be admissions. Income is used as a proxy for financial need.

[4]Includes all upper-middle- or upper-income aid applicants unless there are sufficient upper-income applicants to create a fourth variable.

Factor/ Variable		Probable Data Source	Recommended Coding	Var. Type	Comments
II.	***Academic Preparation***[5]				
A.	Test Scores	AD	Scale[6]	N	Measures change in probability of attendance for each test score increment
B.	High School	AD	Scale	N	Measures changes in probability of attendance for each grade point increment
C.	Aspirations Some College	AD	Some College or less=1 Others=0	DI	Compares students who aspire to complete some college (or less) to those who aspire to complete bachelor's
	Advanced Degree	AD	Advanced Degree=1 Other=0	DI	Compares those who aspire to an advanced degree to those who aspire to complete bachelor's
III.	***Student Aid/Prices***[7] (use variable set A, B, or C)				
A.	Any Aid	SA	Received aid	DI	Use to measure whether receipt of aid increases probability of attendance
B.	Packages[8] Grants only	SA	Grants only=1 All others=0	DI	Compares recipients of this category to non-aid recipients
	Loans only	SA	Loans only=1 All others=0	DI	Same as above
	Loans and Grants	SA	Loans and Grants=1 All others=0	DI	Same as above

[5]At a minimum, either high school grades or test scores are necessary for the analysis. Other variables can be added.

[6]Use ETS/ACT crosswalk if necessary.

[7]Not possible to use tuition unless school has different tuition charges. Three sets of aid variables used in separate analyses.

[8]For all aid package variables, students who do not receive aid (and do not apply) are coded as zero.

Factor/ Variable	Probable Data Source	Recommended Coding	Var. Type	Comments
B. *Cont.*				
Loans and Work	SA	Loans and Work=1 All others=0	DI	Same as above
Grants and Work	SA	Grants and Work=1 All others=0	DI	Same as above
All types	SA	All three types=1 All others=0	DI	Same as above
C. Amounts (Approach used for price-response analysis)				
Grants/ Subsidies	SA	Amounts divided by $1000	N	Provides price response measures for grants
Loans	SA	Amounts divided by $1000	N	Provides price response measures for loans
Work Study	SA	Amounts divided by $1000	N	Provides price response measures for work study
IV. *First-Time Enrollment*				
Enroll	AD	Enroll=1 Not enroll=0	DI	Measure used for baseline probability of enrolling

Scale: Variate Type
N = Numeric
DI = Dichotomous

Scale: Data Source
SA = Student Aid
AD = Admissions

APPENDIX B

Using Design Variables for Income

Somers (1992) compared the use of a set of design variables constructed similarly to the ones described above (and presented in Table 7-1) to a set of design variables constructed from institutional calculations of financial need. She found that income variables were better predictors of first-time enrollment and that financial need variables interacted with the aid variables, because most aid was awarded based on financial need. Therefore, it is more desirable to use income variables as indicators of financial need than to include financial need variables.

The use of dichotomous variables is generally recommended when using logistic regressions (Hosmer and Lemeshow 1989). In a recent study of graduate student persistence, Andrieu (1991) compared the use of a continuous variable for income, coded in dollar amounts, to the use of a series of dichotomous variables for income. She found that using dichotomous variables reduced the unexplained variance, and also showed that the influence of income is not linear. Therefore, the use of dichotomous variables is desirable for income.

Many institutions do not collect information routinely on family income for all students (unless they request this information from The College Board or Scholastic Aptitude Test files, and require these tests of all students). When logistic regressions are used, it is possible to control for the influence of income through the use of a set of dichotomous variables.

The first step is to create a dummy variable for dependency status (either dependent or independent, whichever is smaller, coded as "1" with the opposite being coded as "0"), which controls for income differentials between those who report personal income and those who report family income.

Second, the family income of aid recipients should be divided into three groups: the lower third (or low-income aid applicants); the middle third (or middle-income aid applicants) and the top third (or high-income aid applicants). Alternately, the researcher can make judgments about income levels based on professional experiences, as was the case with examples presented in this paper.

Third, three separate dichotomous variables can be created for income: one for low-income aid applicants (coded as "1" for aid applicants in the low-income group and all others coded as "0"); one for middle-income aid applicants (coded as "1" for applicants in the middle-income group and "0" for all others); and one for high-income aid applicants (coded as "1" for applicants in the high-income group and "0" for all others). These variables compare aid applicants in the three groups to non-aid applicants. They control for the influence of *financial need*, even though income is not known for all applicants. The results can be interpreted as indicators of the level of financial need.

APPENDIX C

Delta-p Statistics

Formula

The following formula is recommended for converting betas for logistic or probit analyses into change in probability measures (delta-p statistics):

$$\text{Delta-p} = \exp(L_1)/[1+\exp(L_1)] - \exp(L_0)/[1+\exp(L_0)]$$

where:

$L_0 = \ln p/(1-p)$ (p = "baseline" p in table)

and

$L_1 = L_0 + \text{beta}$ (Petersen 1984)

Interpreting Delta-p Statistics for Student Aid

First, when the impact of receiving any type of student aid is examined, and the beta is significant for the financial aid variable, then the delta-p statistic for this variable is positive and could be interpreted as increasing the probability of attendance or persistence by a certain percentage point. For example, if the delta-p was 0.085 for a significant beta in a model, then it could be interpreted as meaning that the receipt of student aid increased the probability of attending by 8.5 percentage points. More generally, either a positive or neutral beta coefficient for an "any aid" variable can be interpreted as meaning student aid is effective. A neutral coefficient means students with aid have the same probability of enrolling as non-aided students. Suggestions for interpreting negative coefficients for aid variables are discussed in Appendix F.

Second, when the logistic regression betas for a particular aid package are significant, then the delta-p statistics can be interpreted as meaning that receipt of that package increases the probability that a student will attend (or persist) by a particular number of percentage points. For example, a delta-p of 0.089 would mean that a particular aid package increases the probability of attending by 8.9 percentage points. This type of analysis is appropriate when there are questions about the effectiveness of different types of student aid. Unfortunately, since not all aid packages are consistently significant each year, it may take several analyses, possibly over several years, to conclude that a particular type of package is not effective. Therefore, it may not be desirable to undertake this particular type of analysis at the institutional level.

Third, when the amount of aid is used in the models, the delta-p statistics can be interpreted as price-response measures. For example, if a delta-p for a significant aid variable is coded as 1=$1,000, then a delta-p of 0.045 can be interpreted as meaning that a thousand-dollar increase in student aid increases the probability of attending (or persisting) by 4.5 percentage points—or that a $100 increase increases the probability of persisting by 0.45 percentage points. This type of information can be useful to institutional planners. It can be used to inform decisions about what types of aid to invest in. If this step is taken, different types of aid should be combined into four categories—government grants, loans, work, and institutional grants (and scholarships)—unless there are sound logical reasons for more categories.

APPENDIX D

Descriptive Statistics by Variable in Case Study Institution

From the accepted applicant group, 1,903 (74.4%) attended in the fall of 1989. The demographics on the enrolled group were: 56.3% female, 16.8% African-American, and 4.8% Hispanic. The description of independent variables is summarized below.

Independent Variable	Description	Statistics
Background		
Female	Male	43.7%
	Female	56.3%
African-American	Other	83.2%
	African-American	16.8%
Hispanic	Other	95.2%
	Hispanic	4.8%
Independent	Dependent	91.2%
	Independent	8.8%
Low-income aid applicant	Aid applicant with income less than $15,000	20.3%
	Others	79.7%
Middle-income aid applicant	Aid applicant with income of $15,000 - $30,000	12.6%
	Others	87.4%
High-income aid applicant	Aid applicant with income of more than $30,000	3.6%
	Others	96.4%
Achievement		
National Merit	National Merit Finalist	3.3%
	Others	96.7%
ACT - low	Score of 17 or lower	32.8%
	Others	67.2%
ACT - high	Score of 27 or higher	28.3%
	Others	71.7%

Independent Variable	Description	Statistics
Student Financial Aid*		
Version 1: Aid Offer		
Aid offered	No aid offered	54.8%
	Aid offered	45.2%
Version 2: Amount of Aid		
Total aid $	Average total aid award	$1,648
Version 3: Types of Aid		
Grant $	Average grant award	$ 486
Loan $	Average loan award	$ 616
Work study $	Average work-study award	$ 68
Scholarship $	Average scholarship award	$ 468
Dependent Variable		
Enrolled fall semester 1989	No	25.6%
	Yes	74.4%

*Figures represent average aid awards for total population.

APPENDIX E

Adapting the Model to Meet Local Needs

The basic model can be adapted to address a range of institutional questions about the effectiveness of marketing and aid packaging strategies. For example, in the case study presented above, the model was adapted to examine the effects of a special merit scholarship program. To evaluate specific aid strategies being used by a given college or university, it may be necessary to adapt the basic model proposed in the first part of the paper.

Admissions and financial aid application forms can (and sometimes do) ask questions about how students heard about the college, what factors were important to them in choosing a college, and so forth. The responses to these questions can also be used to construct sets of design variables to assess the effectiveness of different types of aid packaging and marketing strategies. Such experimentation may be desirable; however, a few practical suggestions might help guide such investigations.

First, the variables should be constructed to enable appropriate comparisons. There are three appropriate approaches to specifying variables in logistic and probit models: use continuous variables when a linear relationship is assumed (as was the case with the price and price subsidy variables in the example above); use a single dichotomous variable for discrete variables (*e.g.*, the gender variable in the example); or create a set of design variables (*e.g.*, the sets of income, ethnicity, and aid package variables). The choice among these alternate approaches to specification will depend on the nature of the data and the assumptions being used.

Second, when testing the inclusion of a new set of variables, it is desirable first to consider the sequential logistic regressions as suggested above, then to conduct a final step with the new set of variables added. In this way the researcher can assess what happens as a result of adding the new variables.

APPENDIX F

Assessing the Effectiveness of Aid Strategies

The student aid community has not yet been confronted with ambiguities resulting from the discovery of negative coefficients for aid variables in analyses of the effects of student aid on first-time enrollment. However, as the case study presented in this chapter illustrates, there is a real possibility that aid administrators and others will be confronted by such findings when they do research on this topic. In fact, recent studies have found that aid offers have significant and negative coefficients (Hill 1992; Somers and St. John 1994).

The regression results will indicate when an independent variable, such as student aid, is negatively associated with an outcome. If the researcher simply concludes that student aid is ineffective, then policy makers may decide to reduce internal allocations to aid. *When an analysis indicates the aid variable is significant and negative, it is important to make some judgments about why there is a negative association.*

First, it is possible that other variables not in the model, such as living costs, interact with aid and explain negative coefficients. This problem is illustrated by a recent persistence study (Lyn 1993). Using a model similar to the one used by St. John, Oescher, Andrieu, and Starkey (in press), Lyn (1993) considered the effects of housing costs (added as a new variable to the earlier model). He found that when housing costs were added to the model, aid variables that had previously had a negative association with persistence shifted to having a positive association. As Lyn's analysis indicates, it is possible that other forces not measured by the variables included in a model explain the negative coefficients.

Second, it is possible that negative coefficients are attributable to the fact that aid offers are insufficient. Specifically, if an institution funds all students based on need, but does not have sufficient funds to meet *true need*, then there will be a gap between aid levels and prices which could increase as the amount of aid awarded increases. Such a gap can be referred to as *unmet need* (St. John, Andrieu, Oescher, and Starkey, in press). An institution that relies exclusively on federal student aid, as many colleges do, could find itself in this situation (St. John, Oescher, and Andrieu 1992). For example, in a study of the effects of aid offers made by another public college in the same state as the urban public university considered in Table 7-1, Hill (1992) found that the receipt of a financial aid offer was negatively associated with first-time enrollment (in contrast to the positive association noted in Version 1, Table 7-1). The institution Hill studied had put very little of its own money into grants and instead relied almost entirely on federal student aid, since there was very little state support for need-based grants. Thus, Hill's findings, in comparison to those reported in Table 7-1, support the conclusion reached in the paper. That is, the institutional resources the urban public university (in the case study above) put into its aid programs helped explain the overall finding that aid offers were positively associated with first-time enrollment. *However, a negative coefficient for aid in an institutional study could be attributable at least in part to unmet need.* This interpretation of the meaning of negative coefficients for aid variables is most applicable to grants at institutions that rely most on federal need-based grants.

Third, other factors may explain the negative coefficients for aid variables. For example, it is possible that students simply have a negative reaction to loans, an argument that has occasionally been made (Astin 1975; St. John 1989). Further, it is possible that large amounts of work-study awards are problematic, especially when the hourly wages for work-study are less than students can earn in the local labor market. These possibilities merit consideration when negative coefficients are discovered for loans and work-study, and require supplemental inquiries into local wage rates and student attitudes about loans.

Finally, still another possible explanation for negative coefficients for aid variables is that the institution is offering less aid than other competing institutions. This situation can be especially true for private colleges that compete for students who apply to more than one private college. Again,

supplemental information would be needed to address this possibility. A researcher interested in this question might examine trends in the yield rate for admitted applicants. If the yield rate is low, or has taken a recent downturn, and there is a negative coefficient for aid variables in a logistic model, then the researcher would have a couple of sources of evidence indicating that their aid offers may not be competitive.

In summary, the purpose of institutional research on the effects of student aid is to build an understanding of how well institutional aid strategies are working. Researchers should not be discouraged by finding negative coefficients for aid variables, especially if they can find a reasonable explanation.

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Chapter 7 Notes

1. Parental background may still influence whether an accepted applicant enrolls. Therefore the amount of unexplained error in the model (the higher R^2, or pseudo R^2 for logistic regression, the more error is explained) would be higher than if these variables were excluded. However, the *direct* effects of aid variables would probably be very similar with or without these variables.

2. This table does not include any indicators of the strength of the total model. This decision was made because the *Journal of Student Financial Aid* generally discourages the presentation of model statistics, such as R^2, pseudo R^2 (used instead of an R^2 in logistic regressions since true R^2's can only be calculated for linear regressions), Somer's D, and so forth. These measures are usually required by research journals, such as *Research in Higher Education*.

3. This illustrates the use of a delta-p for a dichotomous variable in a set of design variables. In this case, a set of design variables was used for ethnicity. African-Americans (coded "1" for African-American and "0" for other) and Hispanics (coded "1" for Hispanic and "0" for other) were compared to others (those in the population who are not African-American or Hispanic). The use of sets of design variables for logistic regressions is discussed in Appendix C. See Hosmer and Lemeshow (1989) for a more complete discussion of this approach to variable coding.

4. In this case, the three income variables are a set of design variables comparing aid applicants with different income levels to non-aid applicants (see Appendix B).

5. National Merit finalists were compared to students with mid-range ACT scores (see Appendix D).

6. Consistent with the method described in Appendix A, the amount of aid offered was divided by 1,000. Since this is a linear variable, the delta-p indicates a percentage point change in probability for each unit. Because we divided by 1,000, the unit here is $1,000. Thus, the delta-p can be interpreted as it is here. The method of interpretation can be used for the student aid variables in Version 3, since they were also divided by 1,000.

7. For a discussion of how to use price-response measures to estimate the budget and enrollment effects of changes in pricing and student aid strategies, see St. John (1994).

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CHAPTER 8

Analyzing the Role of Financial Aid in Student Persistence

Patricia Somers and Edward P. St. John

For financial aid directors, most persistence studies have little value. The prevailing methodology surveys a small sample of students and focuses on issues of academic and social integration. While this type of study is important for researching institutional ethos, it is very time consuming and does not adequately consider the effects of financial aid on persistence. This chapter presents a workable model that allows any institution to examine several variables, including aid, using existing data sources.

The research on college student persistence is ambiguous on the question of how financial aid affects student persistence. The dominant model used in persistence research considers the influence of academic and social integration processes (Tinto 1982, 1985), but does not incorporate sufficient information on family income to assess the effects of student aid. Further, studies that have attempted to adapt the Tinto model to assess the effects of student aid have reached divergent conclusions (*e.g.* Moline 1987; Voorhees 1985). This paper proposes and tests a workable model for institutional research on the effects of student aid, a model that meets the criteria proposed in the previous chapter.

Background

Most institutional studies of persistence focus on background, academic, and social integration variables (Tinto 1975, 1982; Pascarella, Duby, et al. 1981; Pascarella and Terenzini 1977, 1979, 1983). Taken as a body, however, these studies have practical limitations. First, much of the research utilizes supplementary data collection. These surveys have limited response rates, which can complicate analysis of the effects of student aid. Further, it is difficult to collect accurate information on family finances (needed to construct a workable model for assessing the effects of student aid) because many students do not know their family income. Thus, for financial aid administrators and other institutional researchers interested in assessing the effects of student aid on persistence, the traditional persistence model not only presents a demanding and time-consuming task that discourages such an endeavor, but also is not likely to generate the type of information that is needed.

Recognizing these limitations, the authors developed an alternative model (St. John 1992; Somers 1992) based on those developed in recent national persistence studies, which built on sociological theories of attainment, economic studies of student demand, and the salient features of Tinto's persistence model. Early national studies examining the effects of student aid on persistence generally controlled for necessary background variables to assess the effects of student aid (*e.g.*, Austin 1975; Peng and Fetters 1978; Terkla 1985), but had inconsistent persistence outcomes. Based on a review of these studies, St. John and colleagues (St. John 1989; St. John, Kirshstein, and Noell 1991) developed a model for assessing the effects of student aid on year-to-year persistence. Later the model was adapted to assess the effects of student aid on within-year persistence (St. John, Andrieu, and Oescher 1992).

Based on this research and related national studies of the effects of student aid on persistence, St. John (1992) proposed a set of models that institutions could use to assess the effects of student aid on first-time enrollment, within-year persistence, and year-to-year persistence. These models, which used extant institutional data sources, were initially tested in a case study (Somers 1992). The model for assessing the effects of student aid on first-time enrollment was presented in the preceding chapter. This chapter describes the workable persistence models developed through this process.

A Workable Persistence Model

Our model assumes that decisions by currently enrolled students to persist are affected by social background, academic preparation in high school, college achievement, college experience, and student aid. The variables related to social background and academic preparation in high school are discussed in the preceding chapter and detailed in its Appendix A. The other factors are discussed below. The variables used in the test of the model presented in this chapter are in the appendix. The statistical methods that are proposed for these persistence studies are the same as those discussed in the previous chapter.

Persistence is defined as the decision to re-enroll during a subsequent semester or year. Analyses of within-year persistence (the decision to re-enroll in the spring semester after enrolling in the fall) or year-to-year persistence (the decision to return the next year) are probably of more interest to those concerned about student aid policy than research examining the number of months completed (*e.g.*, Carroll 1987) or persistence to graduation (*e.g.*, Terkla 1985).

Two measures of *academic experience* should be considered: college grades and full-time attendance. Grades are analogous to (or closely associated with) the academic integration factor that is integral to Tinto's model. Full-time attendance influences whether students get financial aid, and/or the amount of aid they receive. Therefore, at a minimum, researchers investigating the effects of student aid need to control for these influences.

Other factors related to *college experience* can be added to the model. For example, in the model presented here, participation in a campus retention program was examined. Institutions may be interested in examining the effects of having a particular major, living on campus, or other issues of local concern. Variables related to these factors can be incorporated into the model.

Additionally, for the *student financial aid variables*, the convention discussed in the previous chapter can be followed. For each base semester or year, the researcher can consider the effects of the receipt of aid, the amount of aid received, and the type of aid received. The specifications of these variables would be identical to those discussed in the previous chapter, although the researcher would need to update the variable for each base period, adding updated information for each semester examined.

Statistical Method

To describe the relationship between an outcome (dependent) variable and one or more explanatory (independent) variables, statistical regression methods are used. Regression techniques are used to find the "best fit" between the explanatory variables and the outcome variable.

For a model where the outcome variable is dichotomous (*i.e.*, did the student persist or not?), the standard regression formula can seriously misestimate the dependent variable. Instead, a technique known as "logistic regression" is used.

One of the most important questions posed by researchers is: Will a change in the independent variable have a positive or negative impact on the outcome? This question is answered by computing a statistic called "delta-p," which measures the effect on the dependent variable given a change of one unit in an independent variable. Petersen's (1984) delta-p formula is used. The delta-p can be used as a student price response coefficient (SPRC) (Leslie and Brinkman 1988).

Delta-p statistics can be used in two ways. First, for *dichotomous* variables (sex, race, etc.), the delta-p provides a measure of the extent to which the outcome is likely to change if an applicant or student has that characteristic. For example, a delta-p of 0.061 for African-Americans can be interpreted as increasing the probability of persistence or attendance by 6.1 percentage points for this group.

The second use for the delta-p statistic in this study is for *continuous* variables (scholarship dollars, loan dollars, etc.). In these cases, the delta-p can be interpreted as meaning that a change in a unit measure will change the probability of the outcome by a certain percentage. For example, a delta-p statistic of 0.061 per $1,000 of grant aid indicates that the probability of attendance or persistence increases by 6.1 percentage points per $1,000 in grant aid awarded.

Further, there are two ways to use price-response coefficients in planning models (St. John 1991b). The first is as an estimation of participation rates in projection models. Second, the student price response coefficient can be converted to a price elasticity, which is then used to estimate enrollments after participation rates are calculated. Since about one-third of the eligible population attends institutions of higher education, this figure is multiplied by three to obtain a price elasticity (Leslie and Brinkman 1988).

An Example

An example of a within-year persistence study is presented in Table 8-1. Three versions of each logical model are utilized, substituting the following three sets of variables for the factor of student financial aid. When the logistic regression is run, the factors should be listed in the order indicated here:

1. Background, achievement, college experiences, and receipt of any aid.
2. Background, achievement, college experiences, and total aid (dollar amount).
3. Background, achievement, college experiences, and types of aid (by dollar amount).

By analyzing student financial aid in these three ways, a much richer picture of the complexities of the impact of aid is possible. Moreover, it is possible to assess how the aid variables influence the matriculation decisions of students from varying backgrounds.

The population consisted of the 1,473 students who persisted to the spring of 1990 after enrolling as first-time students in the fall of 1989. The institution studied was an urban, public institution of approximately 15,000 students.

The first analysis is for the receipt of any aid. Of the fifteen variables in this iteration, eight were significant. Positive delta-ps are for the variables African-American, Hispanic, independent, middle-income aid applicant, full-time, and GPA-high. There are significant negative delta-ps for female and ACT-low. Of the income variables, only middle-income was significant when aid was added to the model: these students were more likely to persist.

TABLE 8-1: Comparison of Aid Analysis (Within-Year Persistence Model)

Factor/ Variable	Version 1 Any aid Delta-p	Version 2 Aid amount Delta-p	Version 3 Types of aid Delta-p
Background			
Female	-0.0470**	-0.0461	-0.0414
African-American	0.0710*	-0.0481	0.0506
Hispanic	0.1316*	0.1260*	0.1273*
Independent	0.0714**	0.0590	0.0702
Low-income aid applicant	0.0236	-0.1818*	-0.2170*
Middle-income aid applicant	0.1019**	-0.0133	-0.0261
High-income aid applicant	0.0927	-0.0098	-0.0152
Age	0.0001	-0.0007**	-0.0008
Achievement			
ACT - low	-0.0799**	-0.0773*	-0.0811*
ACT - high	0.0283	0.0235	0.0212
College Experiences			
Persistence program	0.0751	0.0833	0.0848
Full-time	0.1805*	0.1782*	0.1785*
GPA - high	0.0911*	0.0928*	0.0924*
GPA - low	0.0414	0.0400	0.0389
Financial Aid			
Any aid?	-0.0017		
Total aid		0.0495*+	
Types and Amounts of Aid			
Grant $			0.0624*+
Loan $			0.0516*+
Work/study $			0.0116+
Scholarship $			0.0537**+

* Significance level = 0.01 ** Significance level =0 .05 + = All of these figures are SPRCs

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In Version 1 of the model, five background variables are significant. Gender is negatively associated with persistence, with women 4.7 percentage points less likely to persist. African-American students are 7.1 percentage points more likely and Hispanic students 13.2 percentage points more likely to persist. Independent and middle-income students are 7 and 10 percentage points more likely to persist, respectively. These are important findings indicating that the mere receipt of aid was negatively associated with persistence for women, but positively associated with persistence for African-American, Hispanic, independent, and middle-income students.

The model for Version 2 combined background, achievement, college experiences, and the variable "amount of total aid." This model was the first to consider dollar amounts for the student aid variable. Of the fifteen variables in this version of the model, seven had a significant association with persistence (eight were significant in the "Any aid" version).

Hispanics were 12.6 percentage points more likely to persist than others. The variable "age" was significantly and negatively associated with the dependent variable, with older students 0.07 percentage points less likely to persist. The probability of persistence for students scoring in the bottom third of the applicant pool on the ACT for this institution was decreased by 7.7 percentage points.

With the total amount of aid controlled for, two college experience variables were significant. Full-time attendance was significantly associated with persistence, increasing the probability of persistence by 17.8 percentage points. Further, having a GPA in the top third of the class at the end of the fall semester increased the likelihood of persistence by 9.3 percentage points. Being a low-income aid applicant was significantly and negatively associated with persistence. When the total amount of aid was controlled for, low-income aid applicants were 18.2 percentage points less likely to persist. The dollar amount of aid was significantly and positively associated with persistence. The price response coefficient was 5.0 percentage points for each $1,000 of aid.

The amount of aid received provides a better picture of the influence of aid on persistence; the negative association between being a low-income aid applicant and persistence reflects the unmet need or "gap" inherent in most aid packages. Moreover, since low-income aid applicants at this institution may rely primarily on federal financial aid, which was reduced during the 1980s, the problem of unmet need has increased.

Version 3 utilized the model in which the variables for types and amounts of financial aid (grant $, loan $, work/study $, and scholarship $) were added to the factors of background, achievement, and college experiences. Of the eighteen variables of the model, eight significantly influenced persistence.

As in the previous model, the following variables were significantly associated with persistence: Hispanic, low-income aid applicant, ACT-low, full-time attendance and GPA-high. Low-income aid applicants were 21.7 percentage points less likely to persist when the types and amounts of aid were considered. This was consistent with the findings in the previous step about the total amount of aid, and suggested that more need-based aid was necessary to promote within-year persistence. Hispanic students were 12.7 percentage points more likely to persist.

The amounts of three of the four types of aid were significantly associated with persistence. Students receiving grants were 6.2 percentage points more likely to persist. Receiving loans increased the probability of persistence by 5.2 percentage points, and receiving scholarships increased the probability of persistence by 5.4 percentage points. This produced a price response coefficient of 6.3 percentage points per $1,000 in grants awarded, 5.2 percentage points per $1,000 in loans, and 5.4 percentage points per $1,000 in scholarships.

Discussion

The three versions of the within-year persistence logistical model using student aid variables offer insights into how aid effects persistence. Throughout the three analyses, the variables Hispanic, full-time,

and GPA-high were significantly associated with persistence. The variable ACT-low also was consistently negatively associated with persistence between the first and second semesters.

In two of the three analyses, there were significant associations between within-year persistence and student financial aid. Both of these analyses considered actual dollar amounts rather than mere receipt of aid. When the amount of aid was considered (Version 2), a student price response coefficient of 5.0 percentage points per $1,000 in aid was found. When the types and amounts of aid were examined (Version 3), student price response coefficients of 6.2 percentage points per $1,000 in grants, 5.2 percentage points per $1,000 in loans, and 5.4 percentage points per $1,000 in scholarships were discovered.

Based on the comparisons between the three versions of the model, five conclusions emerged from these data.

1. Low-income aid applicants didn't persist as well as others when the amount of aid and the type/amount of aid were considered. This reflects the "gap," or unmet financial need, of low-income aid applicants; their financial aid packages were inadequate. This group of "high-risk" students was very price responsive and additional need-based grants could be effective in promoting their persistence.

2. The total amount of aid offered was significant in promoting within-year persistence for all students.

3. The amounts of grants, loans, and scholarships (which low-income aid applicants receive) were significantly associated with persistence.

4. Women students were less likely to persist when the amount of aid was considered, suggesting that this group may have special needs that could also be met through additional need-based grants.

5. African-American students were responsive to both the receipt of aid and the amount of aid. Additional aid, both need-based and merit, could increase the persistence of African-American students.

Institutional Implications

The conclusions from this research suggest implications for the institutional policy of the university studied. Findings on who enrolls and who persists can be important in shaping institutional policy in financial aid and academic affairs.

First, students who participated in the persistence program were as likely to persist as other students when all other variables were controlled. These were all high-risk students who had low test scores, inadequate preparation in high school, learning disabilities, or were otherwise disadvantaged. That they persisted in numbers equal to other students indicated that the program works and is providing a "level playing field" for these students.

Second, there are important implications about persistence of low-income students. For within-year persistence, low-income aid applicants are less likely to persist, and there is a negative association between the receipt of aid and being in this group. This implies that many low-income aid applicants initially assume that the aid award is sufficient to pay their expenses; however, after the first semester, some leave for financial reasons. This suggests there is a "gap" between the aid award and the true cost of attendance. Unfortunately, since the institution relies mainly on federal funds for financial aid for this

group of students, there is little flexibility in the amount of awards. If it is important to retain this group of students, additional money from private sources or from the state may be necessary.

Third, the study results show that aid does make a difference in persistence. This has implications for the institution in crafting a financial aid policy that would maximize persistence. While the university relies primarily on federal financial aid, funds for campus-based programs and scholarships are within the control of the institution and could be allocated differently.

Fourth, a careful examination of the needs of women students should be undertaken. From these data, it is clear that they persist in lower numbers than men. While aid is a factor in these decisions, there also may be factors outside of this model that should be addressed.

Fifth, while the positive association between full-time attendance and persistence is expected, it should be examined in the broader context of the university mission. Academic policies, schedules, and lack of support services at convenient hours may be factors which influence the attrition of part-time students.

Conclusions

This example, drawn from a more comprehensive study of the effects of student aid on the matriculation process (Somers 1992), illustrates that the workable model can be operationalized and can result in practical and useful knowledge. The value of conducting institutional research on the effects of student aid can also be illustrated by looking at the impact of aid strategies across a sequence of student decisions, a point illustrated by Somers (1992). Her first-time enrollment analysis (presented in the previous chapter) found that scholarships helped attract students to the university. Further, the analysis presented here indicates that these scholarships and other forms of student aid offered were all effective in promoting within-year persistence (see Table 8-1). However, the analysis of year-to-year persistence found that scholarships were negatively associated with first-to-second-year persistence. These findings led the author to question the institution's strategy of offering very large scholarships (Somers 1993). It appears that large sums of money can attract but not retain students if the environment is not a good match. Therefore, it is desirable that aid administrators and other institutional researchers consider the full sequence of student decisions affected by a particular aid strategy.

APPENDIX

Variable Descriptions
Independent Variables

Factor/variable	Coding
Background	
Female	0 = male 1 = female
African-American	0 = No 1 = Yes
Hispanic	0 = No 1 = Yes
Age	Numeric
Low-income aid applicant ($1-15,000)*	0 = No 1 = Yes
Middle-income aid applicant ($15,001-40,000)*	0 = No 1 = Yes
High-income aid applicant ($40,001 and greater)*	0 = No 1 = Yes
Achievement	
ACT - low*	0 = No 1 = Yes
ACT - high*	0 = No 1 = Yes
Student Financial Aid	
Aid offered	0 = No 1 = Yes
Total financial aid amount offered	Numeric
Types of Aid	
Grant $ offered	Numeric
Work study $ offered	Numeric
Loan $ offered	Numeric
Scholarship $ offered	Numeric
College Experiences	
Grade point average - low*	0 = No 1 = Yes
Grade point average - high*	0 = No 1 = Yes
Full-time	0 = No 1 = Yes
Persistence program participation	0 = No 1 = Yes

*These variable ranges will be determined by the individual institution by dividing the range into three equal categories.

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Dependent Variables

Variable	Coding
Persistence	0 = No 1 = Yes

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CHAPTER 9

Enrollment Goals, Tuition Pricing, and Institutional Aid Commitments

Nathan Dickmeyer

This chapter examines the conceptual and research difficulties associated with setting broad financial aid policies. Three competing institutional and financial aid goals make financial aid policy development hazardous. Institutions generally set goals for diversity, enrollment, and financial stability. These goals compete because funds used for diversity can impinge on overall enrollment goals, while using excess financial aid funds in pursuit of the first two goals can increase the risk of institutional financial instability.

The interaction of these goals will be explored through a series of conceptual models; this is intended to assist policy makers such as directors of financial aid, financial aid policy committees, and others. Research is used to support an understanding of the conceptual models discussed and to connect the models to a particular institution.

By definition, any conceptual model of economic behavior is a simplification of behaviors in the real world. The reliability of conceptual models rests less on their basic assumptions and more on the adequacy of measurement of all relevant variables. The Federal Reserve, for example, uses very complex economic models to help it set interest rates. Nevertheless, the models do not include every possible variable of the economic world. The same is true of an economic model of institutional pricing and enrollment. However, based on fairly firm behavioral assumptions, we may be able to graph changes in enrollment against changes in net price (tuition less average aid). But the relationship between these variables may be somewhat or greatly affected by other, unmeasured variables, such as student perception of institutional quality or changes in competitor quality.

As a result, this research method is developmental. Policy makers should understand the models and their impact on policy arenas in their own institutions, and use this understanding to make policy decisions. They should then attempt to make the models more sophisticated by improving the data and adding variables, if possible.

Background

With the slower growth in federal student grant support in the 1980s, most colleges and universities raised institutional levels of financial aid for students, paying for this increased support largely by raising tuition. Many institutions that were spending 5% of their budgets on unrestricted student financial aid in the 1970s are now spending up to 20% and more of their budgets to maintain the aid policies of that earlier decade. Many are attempting to remain need-blind in their admissions and to maintain diversity. Those that packaged aid to meet full need are attempting to keep that policy. If they formerly met only a portion of need, they are attempting to meet that same proportion. Despite these efforts, however, loans have been necessarily used more heavily to replace insufficient federal grant aid, while increasing amounts of institutional grants have been used to soften the blow and fill in gaps in the federal grant aid programs.

At the same time, institutions have been trying to return faculty and staff salaries to the levels they were before the years of hyper-inflation. Increasing salary levels and institutionally-funded student aid drive overall budgets higher. To compensate, tuitions have been raised, driving aid levels even higher in order to maintain previous aid policies. The result has been a skyrocketing of tuition prices, much slower

growth of net tuition (tuition less institutionally-funded grant aid), and a burgeoning fraction of the total expense budget dedicated to institutionally-funded student aid.

With growing tuition rates and aid levels, the proportion of students on aid has increased. Students who would not have been eligible in the 1970s with lower tuition prices have become eligible for financial aid, and fewer students are now "full-payers." Many of those who were "full-payers" from a grant standpoint, however, have become moderate to heavy borrowers. Ineligible for grant aid, these students are financing their education with loans. These two trends—fewer "full-payers" and an increasing proportion of heavy borrowers—will be important to our later analysis.

The Diversity Goal

Many institutions have developed policies that use the financial aid award system to improve student diversity. Some institutions focus only on income diversity and rely on policies of need-blind admissions and full-need-award structures to create a diverse campus. Other institutions go beyond income diversity and have set aside funds specifically targeted to under-represented groups or groups against whom there was discrimination in the past.

After more quantitative diversity goals are developed, research should determine the cost of moving toward those goals. What is the institutional cost per student to achieve each goal? What would be the cost for 100% achievement of this goal? These calculations depend on the nature of the current policy. If an aid program exists for Blacks from South Africa that has been successful at $25,000 per year per student for four students out of a goal of eight, then 100% success would require another $100,000. Suppose, however, the policy to recruit students of color rests on decreasing the loan burden for all students with aid by a change in the general aid packaging formula. Then the calculations must be carried out for all students. The impact of attempting to increase the number and proportion of minorities and the cost of this goal, implemented by revising the general allocation rule, could be very expensive.

This first research area determines the cost of maintaining and furthering diversity goals. These costs must be traded off against the other goals of maximizing revenues and stabilizing financial viability.

Maximizing Revenues: The Economic View of Institutions

A second goal that places a burden on financial aid policy is that of achieving a level of enrollment that keeps an institution within financial equilibrium. The concept of financial equilibrium and the role of pricing, including financial aid, is discussed below.

A systemic view requires that we define the boundaries of an institution. In some cases this is easy; the institution has a campus or campuses and nearly every educational and related financial transaction refers to and defines the work of the institution as a separate organization. These boundaries can grow fuzzy, but the rules of accounting are devoted to determining which transactions contribute to the revenues and expenditures of a defined institution.

Within these boundaries *transformations* and *transactions* occur. Students are transformed from programming, calculus, and *Moby Dick* ignoramuses to near virtuosos on these subjects. For such transformations, students, the state, the public, and previous graduates provide funds to the institution. The institution distributes these funds as salaries to faculty and staff, and as payments for goods and other services. Inflows and outflows of funds are measured and controlled by transactions. The institution may also set aside funds or use reserves to make up for year-to-year financial shifts. There are many similar internal transactions.

In broad terms, the institution depends on inflow transactions equaling or exceeding the outflow transactions necessary to provide the expected transformations. The balance is delicate. The value of the transformations must garner inflows equaling or exceeding the outflows necessary to bring them about.

Systemic failure is easily possible. Outflows (salaries paid to faculty and staff, the costs of supplies and equipment, debt service on buildings) may not be sufficient or directed well enough to produce transformations at a quality or quantity level whereby inflows (tuition and state support) equal these outflows.

Negative feedback is detectable in such systems. A failure to direct outflows in a way that keeps transformations sufficiently valued can lead to a fall-off in inflows. Resources necessary to redirect the transformations become unavailable and the value of transformations can continue to fall.

A system in *equilibrium* has inflows equaling outflows, with transformations being valued sufficiently to justify the inflows. Disturbances to equilibrium can be caused by an increase in the cost of outflows or a decrease in the effectiveness of the outflows. The change in effectiveness can be initiated in two ways: either the method of transformation is degraded (an internal change) or else the environment changes its value for the transformation (an external change).

An example of an internal change would be a faculty time-emphasis shift away from teaching and toward consulting, forcing a decrease in load and an increase in class size. The quality of the transformation, teaching of students, would then be degraded, and its value lowered.

An example of an external change would be when a competitor offers students a similar set of transformations or major of the same quality at a lower tuition. The value of the transformation declines because substitution is possible, and the consumer can purchase more goods in total at a lower price. Thus, inflow declines.

Negative disturbances to equilibrium result in outflows exceeding inflows. Resources available to improve instructional and other transformations become more scarce and *disequilibrium* occurs. For equilibrium to return, institutional outflows must decline. Unfortunately, because some outflows are fixed and not easily reduced, equilibrium becomes more difficult to restore, to the point where the institution decides that it has lost its place in the competitive market. Most institutions can continue for many years in severe disequilibrium, living on loans and depleting other resources, as long as they believe that they have some place in the competitive market—that they have a mission and serve the public.

Institutions may also counteract disequilibrium by increasing efficiency (paying faculty and staff less and/or increasing workloads) or by expanding inflows (finding new gift sources). Both are difficult avenues to pursue, but both are commonly used.

Thus, the systemic view shows the importance of balancing inflows and outflows by maintaining the transformations valued by those who provide the inflows. Transformation value is measured in relative terms by student consumers, because competitors generally exist who will provide similar transformations. Transformation value is also measured intrinsically, based on the earning power of graduates.

The Market

A campus organization does not exist as a lone entity. There are many others with similar internal transactions and transformations, and thus, there are at least short-term limits on available funding for transformations. In an unregulated market, there are consumers (those who demand the transformations), competitors (those who provide similar transformations), and those who provide other products that tempt consumer resources (second-order competitors). Other colleges are first-order competitors, and cars, for example, are second-order competitors. Sometimes a young person would rather have a car than go to college, or go to a more expensive college.

In an economic sense, if you produce something, even if it is only laughter, and someone is willing to pay for it, then you have a product. Consumer willingness to pay for that good or service (or effect) is measured by what must be given up for it (its price). Consumer willingness to pay this price is determined by perceptions of the utility of this good and one's ability to get an identical good elsewhere at an equal

or better price. Consumer perception of the utility of this good is determined by estimates of current and future value, modified by the consumer's determination of saturation (is one more increment of this good worth the cost?).

Consumers

Consumers include all those who contribute inputs and receive some benefit, even if the benefit is only psychological (as might be the benefit to a donor). Here are the key assumptions about consumers:

First, *consumers have limited resources*. They are only able to provide inflows for a limited number of organizations because they themselves have a limit on the value of the transformations that they are able to bring about. Before the 1950s, families paid for education primarily from savings. For a limited number of American families, inflows exceeded outflows, allowing them to pass resources down a generation. This funding strategy was perpetuated because each new generation was able to use the transformation purchased (a college education) to develop earnings (inflow) that allowed it to provide funding for the next generation.

During the 1950s, loan programs were created that allowed students to transfer funds to colleges and universities based on the value of potential earnings. This particular transformation, higher education, was recognized as an enhancer of future earnings and therefore was viewed as allowing future excesses of inflows over outflows. This excess was then tapped in the future to pay back the loan.

Regardless of whether the transaction of funds from students to the institution comes from a current excess of income over expenditures for a student, an intergenerational transfer, or from borrowing from expected future excesses of income over expenditure, there is a limit to the funding that is available.

Second, within that limit, *consumers have choice*. Students may choose from over 5,000 different educational institutions. They may also choose to buy a car or join the army. They may choose to live at home and buy and read great books.

Third, within those choices, *consumers have preferences*. Each choice may be assigned a set of multidimensional values that are combined rationally or intuitively into a preference. This intuition depends on student assessments of final outcomes, guesses about future choices and risks of future events.

Choices have multiple dimensions, and include both quantifiable items (future income streams) and non-quantifiable items (social happiness on campus). Combining these dimensions is not easy. High school seniors agonize over college choices based on factors like prestige values that may reflect future income, intellectual growth and ego, and factors like social values (as in the apparent quality of the Greek letter society system). Combining these dimensions is often done very crudely with poor information, based on subjective impressions such as other students' success and campus appearance. The decision often comes down to establishing one or two critical factors ("It has to have the curriculum I want and not be more than 100 miles away from home"), and one or two "good feeling" factors ("The faculty and staff are friendly and the dorms are new"). The "good feeling" factors sometimes seem like *post hoc* rationalizations of intuitive decisions. Nonetheless, these factors are important parts of the intuitive decision. Cost and financial aid packages are two other important critical factors.

In making the decision, students must also assess their own final *outcomes*: doctor, lawyer, cafe chef. They will develop scenarios about where the choice should and will lead. Sometimes these are very vague choices, sometimes very clear. Few doctors have the luxury of beginning college with doctoring as a vague goal. Many students, however, have unrealistic ideas about life after college.

Students must also make some guesses about their future life choices. Will they actually choose to go to medical or law school? Will they actually choose to work for a brokerage house? Most students have the mistaken opinion that they will make these future choices rather easily.

Students must also assess the outcomes of future events. Will they be accepted at any medical schools? Will they pass the bar? Will they get into a sorority? Research has shown that the more

improbable the outcome, the greater the error in assessing the probability. Many people act as if they had a one-in-a-hundred chance of winning a lottery even though the chance of winning is only one in a million. Nevertheless, this attitude is not entirely negative; it keeps us and the students happy. Potential students need generous amounts of hope when they are making life choices.

Bundling these assumptions together, we can see that the limit on student resources or potential student resources also limits the inflows into our institution and into institutions in general. Students may choose to use these resources at our institution or in other ways: saving them, using them in other institutions, or using them in non-educational activities.

Competitors

Competitors are any other economic entities that have the potential to reduce an institution's inflows. Here are key assumptions about competitors:

First, *the law of individuality holds for competitors because each organization is fundamentally a human organization.* Consumers perceive differences in the transformations provided by each organization. The differences among colleges and universities are both lesser and greater than we acknowledge: lesser because simply living for four or five years brings about a transformation with or without the intervention of the institution; greater because we seldom fully acknowledge the nonacademic growth differences that can occur at institutions.

The term "transformation" was used consciously to focus the reader's attention on the full range of "products" that educational institutions offer. While many educational transformations are tested and taken for granted—or examined and found lacking—important transformations that help make people better able to work with each other and care for each other go unmeasured. The ability to make social and emotional bonds is part of an important transformation at institutions that often goes unmeasured, is seldom given as an explicit goal, and is usually simply ignored. Nevertheless, there are many institutions that are very good at this. Hence, perceived differences may have a degree of accuracy not always acknowledged.

Second, *competitors that provide transformations for which there is no demand do not exist.* In other words, transformations must be attractive. The market is made up exclusively of those institutions that have found some way of attracting consumers.

Price Elasticity

Price elasticity for colleges and universities measures the behavior of consumers (current and potential students) whenever they perceive a change in price (see Table 9-1). If price elasticity approaches zero, the behavior can be characterized as a lack of concern for prices. As price elasticity approaches –1, the concern for price is proportional to the price increase. That is, any given increase in price results in a similar, proportionate decrease in enrollment, usually in the form of some students taking fewer credits and some potential students not enrolling at all. Price elasticity somewhere between zero and –1 indicates a behavioral enrollment reaction that is not proportional to the percentage price increase.

If price elasticity were zero (perfectly inelastic) under all conditions, then an institution could raise prices forever without a fall-off in enrollment. The maximum amount of revenue generated would be infinite because of the infinite willingness of students to absorb higher tuitions. This is not a likely scenario.

On the other hand, if elasticity were –1 (exactly elastic) at all tuition levels, then whenever an institution raised tuition, the increase would be met with an equal decrease in enrollment and net revenues would be unchanged. This too does not seem to be the case in higher education. Historically, an increase in tuition has not meant a proportionate decrease in enrollment.

A third possibility is that elasticity is moderate at all tuition levels, say –0.5. In this case, a tuition increase is met by a decrease in enrollment, but one that allows the institution to gain tuition revenues. If an institution has 100 students and a tuition price of $200, then total tuition revenue would be $20,000. With a –0.5 elasticity a 10% increase in tuition to $220 would cause enrollment (all else being equal) to fall to 95 (5% of 100), but total tuition revenue would climb to $20,900, a gain of 4.5%. Under this scenario, an institution could continue to increase tuitions infinitely. Although enrollment would fall, total tuition revenues would climb continuously (at least to the point where enrollments dropped below one, unless we assumed a tremendous part-time tuition rate for that final, dismal student).

TABLE 9-1. Variations in Elasticity

Elasticity variable	Reaction	Called
0	Any change in price, no change in enrollment.	Inelastic
0 to –1	Any change in price, smaller % change in in enrollment.	Partially Elastic
–1	Any change in price, same % change in enrollment.	Elastic
Above –1	Any change in price, greater % change in enrollment.	Hyper-elastic

What appears to happen in higher education, however, is more complex than a single elasticity at all tuition levels. Elasticity probably goes from near zero at low tuition rates, then approaches –1 as the price increases. Behavior begins with the first scenario, moves to the second, then approaches and perhaps exceeds the third. Plotting enrollments against tuition price, we derive a line that is level near current tuition rates and then begins to drop off more and more steeply, perhaps with a fast plunge at a critical point when the tuition rate exceeds rates of all similar competitors (see Fig. 9-1). The resulting impact on total tuition revenues is even more interesting.

In Figure 9-1, elasticity is demonstrated by the slope of the enrollment line, the one that falls off to the right. Elasticity is the change in price divided by the change in volume or, in this case, enrollments. When elasticity is –1, the changes in percentage terms are opposite *but equal*, and the graph is a straight line at a 45-degree angle running across the graph to the right (assuming that the X and Y scales are equal). When elasticity is between zero and –1, then an increase in price is reflected in a *smaller* change in enrollments per percentage change in price and the line is less steep. When elasticity is more than –1, then a given percentage change in price results in a *greater* percentage change in enrollment and a steeper line. When elasticity is zero, then any change in price causes *no change* in enrollment, and the line is flat.

The laws of substitution and marginal utility demand that most elasticities are negative. The more something costs, the fewer units will be purchased; it is more likely that a competitor will be able to offer the same good at a lower price. It is also more likely that the appeal of a substitute good will override spending on tuition (or the more likely it is that potential students with lower budgets will purchase other

necessities instead of education). Thus, we need to evaluate whether tuition price elasticity is closer to –1 or to zero. How does enrollment actually change when the tuition rate changes?

Figure 9-1 shows the classical marketing approach to tuition revenue maximization. It shows that with rising tuition, enrollment falls, quickly at first (*e.g.*, when California community colleges went from very low tuition to a moderate fee, enrollments dropped quite steeply), decline more slowly later, then decline quickly at some critical point, while total tuition revenues continue to climb, until the falling enrollment effect overwhelms the gain in total revenue caused by increased tuitions. Enrollments tend to be inelastic for a range of tuitions. Then at some more critical levels, they become much more elastic, plunging steeply at a critical point. Total tuition income is simply the tuition rate at some point on the horizontal axis multiplied by the enrollment achieved at that point.

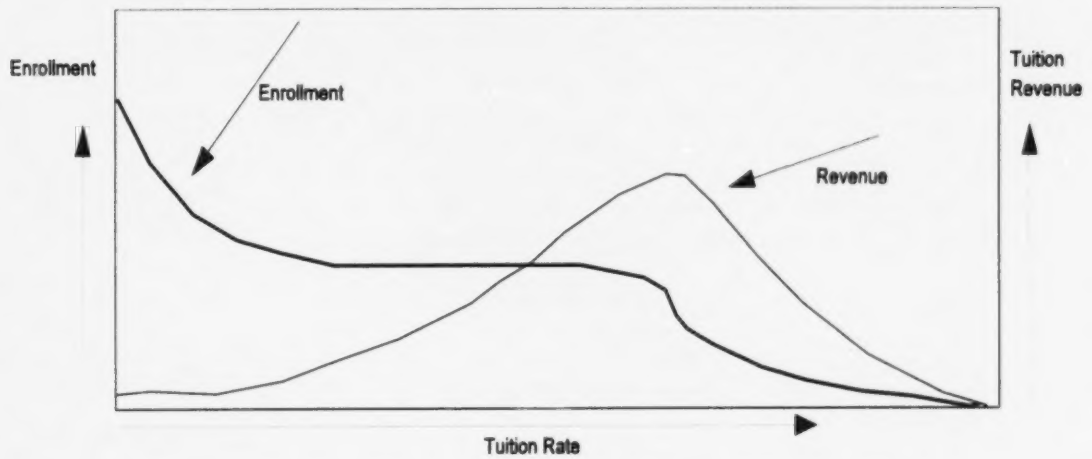

Fig. 9-1. Relationship of Increasing Tuition Rate to Enrollment and Tuition Revenue.

Figure 9-1 shows the theoretical relationship between increasing tuition rates and tuition revenues: at some tuition level, tuition revenues are maximized. For a range of tuition prices before the optimum point, elasticity of demand is closer to zero than to –1. Past the optimum point, however, elasticity is more negative than –1, such that a 1% increase in tuition causes a greater than 1% decline in enrollment. The figure exaggerates this idea, but it demonstrates the point of discontinuity where a large number of students find the tuition price too high compared to the price of other institutions or compared to the perceived benefit of the educational experience.

At a recent workshop where these ideas were presented, about 15% of the participants reported that they believed they had exceeded the optimum point. These institutions felt that their last increases in tuition had caused a decline in enrollments at a rate that reduced their total tuition revenue.

Excess Revenue

It is vital to optimize "excess revenue." Excess revenue is revenue less expenses (similar to the "profits" of profit-making firms). More important to institutional financial survival is the improvement of excess revenue, not just enrollment or total tuition revenue. If the extra expense of increasing tuition revenue is too great, then the financial benefit to the institution is limited. This analysis requires evaluating a number of other complicating factors to make it complete. *Because expenses do not vary*

smoothly with changes in enrollment, the tuition rate that optimizes total tuition revenues may not be the same as the one that optimizes total excess revenue.

Consider first the expense changes related to a declining number of students. Some of these expenses are fixed, such as the cost of the President's Office. Some might be reduced with each student, such as the cost of processing registrations and transcripts. And some might come down only in lumps, such as a reduction in staff in the Housing Office when a residence hall is converted to other uses.

For many institutional policy makers this emphasis on tuition increase and resulting enrollment decline is theoretical and seems implausible. For many years tuitions went up and enrollments either rose or remained steady. Nevertheless, while enrollments at many institutions increased or remained steady over the last two decades, they did so apparently at the very flat, inelastic section of the elasticity curve, far below the highly elastic drop-off. In addition, those institutions that were higher on the demand curve, that might have suffered declines because of tuition increases in the face of increasing elasticity, avoided them by timing increases with increasing demographic demand and by increasing value. In that way, elasticity-driven enrollment declines were swamped by other, managed factors.

The Shape of the Graph of Total Excess Revenue vs. Tuition Rate

A decline in enrollment of 1% does not cause a 1% decline in expenses, certainly not over the short run. If expenses do not change at all when tuition rates and hence enrollment changes, then a graph of excess revenue could simply be shown below the graph of total tuition revenue, and both would illustrate the same exact shape. The vertical distance between the two would simply be the same fixed amount of expenses at every enrollment level.

Expenses, however, do not change like that. On the left side of the optimum tuition point, where tuition revenue grows in response to a tuition rate increase (because the enrollment decline is less than the tuition rate increase within that range of tuition increase), *any* decline in expenses (such as lower registration processing costs) as a result of an enrollment decline adds to the tuition revenue growth. This increases the slope of the line graphing excess revenue against tuition rate leading to the optimum. As long as not all expenses are fixed with respect to enrollment, and as long as the institution is not yet at the optimum level, it makes even more financial sense to raise tuition because decline in expenses and falling enrollments do not completely counteract the effect of the tuition increase.

On the right side of the optimum tuition rate, tuition revenues decline in response to a hike in tuition because enrollments drop off faster than the tuition rate hike. The decline in expenses as enrollment falls, however, slows down the fall in excess revenue relative to the rate of decline in total tuition revenue. This makes the slope of the line graphing excess revenue against tuition rate as it leads away from the optimum point less steep. Thus, considering the possibility of an expense decline when deciding whether to increase tuition, knowing that enrollment may decline, removes some of the sting of being wrong. If you still have some room before you reach the optimum tuition rate, then the excess revenue response is better than the tuition revenue response. If you are past the optimum, then the drop in excess revenues is less than the tuition revenue drop.

Now, does the optimum move when we go from examining *total* tuition revenue to adding the impact of expense changes and considering excess revenues? The lower the proportion of fixed expenses (the more expenses can change in response to a change in enrollment), the more the optimum moves to the right, toward higher tuition rates. *At the optimum, the rate of change in the tuition rate equals the rate of change in enrollment while tuition revenue (the product of the two) remains unchanged.* An increase in tuition rate, however, would cause a decline in enrollment. Although total tuition revenue would be unchanged, expenses for educating smaller numbers of students would decrease (as long as less than 100% of expenses were fixed) and thus excess revenue would continue to rise. We would want to increase the tuition rate above the optimum indicated by total tuition revenue until the effect of declining

enrollments overwhelmed the effect of falling expenses. This point occurs when most of the variable expense declines are "used up" and nothing but fixed expenses remain. Thus, the "hump" for the *excess revenue* versus tuition rate graph would be a finite amount to the right of the "hump" for the total tuition revenue graph.

The Impact of Expense Changes

Let us return to the example of a college with 100 students, a $200 tuition rate and a market with a –0.5% price elasticity at that tuition level. A total tuition revenue response to a 10% price increase to $220 was about 4.5%, because a $20 dollar change in tuition caused about a $1,000 increase in revenues—a fairly steep point on the curve, but still not close to the optimum.

If we also assume that the 5% decline in students produces a 1% decline in expenses (four-fifths of this college's expenses are fixed), and we assume that their total expenses began at $20,000, then we can calculate the percentage change of excess revenues. In the first year, excess revenue simply equals $0, the $20,000 total tuition revenue less $20,000 in expenses. In the second year, total tuition revenue goes up to about $21,000 with a 10% increase in tuition ($220 times about 95 students). Expenses would decline 1% to about $19,800, and excess revenue becomes $1,200. Thus, while the tuition rate increased by $20, excess revenue (or profit, if you will) increased by $1,200. The slope of the chart of excess revenue against tuition rate is steeper (the response is $1,200 for a $20 change in tuition) than for total tuition revenue at this point (the response is $1,000 for a $20 change in tuition). "Profits" go up faster than simply revenue because some expenses come down at the same time.

Thus, consideration of student behavior in response to changes in expenses refines our estimate of the optimum, economic tuition rate and increases our knowledge of the risks of missing that point. If our tuition price judgments were based on a knowledge of the elasticity curve for total tuition revenue alone, we would be unaware of the steep changes in excess revenue because of expense implications at many points along the curve.

Optimum Excess Revenue and Financial Aid

Financial aid is an expense component that behaves very differently than other expenses. Whereas other expenses fall at a slower rate than the enrollment decrease (which is itself usually slower than the rate of tuition increase), financial aid usually *increases* at a high rate with each tuition increase. Financial aid expectations may or may not change at all with enrollment decreases, depending on the level of aid provided to the non-enrolling students. In general, if the institution has an aid policy that tries to meet a certain portion, if not all, of need, then an increase in tuition increases student financial need faster than the tuition increase. First, the increase applies to all existing aided students at the same rate as the tuition increase. All of their budgets may be expected to go up roughly by the expense of the tuition increase. Increases in family income may mitigate this somewhat, but the percentage increase in aid is usually close to the increase in tuition for this group alone. Second, an increase in tuition can bring more students into the eligible or financially needy group. Adding this group's financial needs to those of the first generally causes financial aid to increase faster than tuition increases.

However, if enrollment declines, then the need for aid lessens, especially if the decline is among those who receive aid. Most institutions, however, have carefully tested and calculated tuition and aid policies such that enrollment declines do not occur, especially among needy students. Nonetheless, we will consider what happens as the tuition rate approaches the previously calculated "optimum."

If aid policies do not change, then fewer and fewer students will be enrolled as tuition goes up. Fewer and fewer of these remaining students will be full-payers, as more students qualify for aid with the higher tuition rate and with the same aid policies. Price resistance will be greater for those full-payers

who have high incomes and who therefore have more alternatives. Those with lower incomes will get some relief from the continuation of the institution's policy to meet some or all need, and financial aid budgets will increase faster than total tuition revenues. *The fast growth of the financial aid budget will cause excess revenue to peak at a lower tuition rate than we would have found in an analysis that neglected financial aid.*

Because financial aid works in the opposite direction of other expenses, the "hump" will flatten a bit. Any increase in tuition on the lower slopes will not have as beneficial an effect (in percentage or slope terms). At some point the institution is buying students. Higher tuitions are counteracted by increased aid. Enrollment does not decline much, but excess revenues go negative very soon. Thus, the slope becomes more shallow and peaks at lower tuition levels.

Finding the Optimal Net Tuition Price

We now face many questions. How does enrollment change with price change at each tuition rate? How do expenses differ at different enrollment levels? How is the financial aid budget affected by changes in tuition rate and enrollment? One way to simplify these questions is to attempt to measure elasticity against changes in net tuition, not stated tuition (the published tuition rate).

Net tuition is the tuition price less grant aid (assuming that in the long run loans and work do not really change the price felt by students). With this simplification we can then attempt to find the optimal *net tuition* price in terms of excess revenues. We will need to be able to measure elasticity of net tuition versus enrollment, and we will need to understand the fixed and variable expense structure of the institution with regard only to changes in enrollment. Once we have an optimum net tuition, then we can design an appropriate tuition price and a financial aid packaging strategy that equates to the optimum net tuition price.

We must remember that any hints that we may pick up about the optimum net tuition price are based on some assumptions about how students react to list price and aid awards. High tuition frightens some students away even before they learn of aid packages. Other students are overly attracted by generous aid awards, even though tuition may be high. Nevertheless, research can shed some light on where the institution is on the curve and provide early warning of a detrimental situation.

The researcher should prepare a graph showing enrollments on the vertical axis against net tuition price adjusted by CPI (or, in another variation, adjusted by net family income indexes). Net tuition price is total tuition revenue less total non-work and non-loan aid expenses divided by the student FTE (the average award). This graph would show enrollment reaction to net price. If this graph is level over several years, then price/enrollment remains inelastic and the institution has some flexibility. If it shows a decline in enrollment with increases in net, adjusted price, then the institution could be approaching the optimum point and a second graph is necessary.

This second graph would show total net tuition revenue against enrollment. This analysis ignores variable costs, but would include financial aid. Both graphs should label the year of each point to highlight trends, if any. Superimposing the two graphs would show the net tuition revenue response to changes in net tuition price. If total net tuition revenue declines with net tuition increases, then the institution is past the optimization point for tuition.

This analysis is helpful in the search for a tuition and financial aid policy that maximizes revenue and helps the institution maintain financial equilibrium. However, it ignores the negative public relations fallout of continued increases in tuition, even if student aid is used to cushion those increases. Additionally, it focuses neither on diversity, nor on risk.

Risk and Financial Aid as a Proportion of the Budget

If the enrollment drop-off in response to a tuition increase is concentrated among full tuition payers, then institutions with high financial aid to total budget ratios are hit financially harder than similar institutions with low financial aid to total budget ratios. This premise rests on the hypothesis that enrollment declines can occur more among full-payers than among aided students when tuition increases occur, when institutions maintain their previous aid policies. From this hypothesis one can derive the relationship between financial risk and the proportion of the budget which is financial aid. Policy makers can then explore the trade-off between risk levels and the first two goals, diversity and enrollment, where pursuit of those goals leads inevitably to more and more "discounting" of tuition and a greater proportion of the budget "spent" on institutionally-funded financial aid.

Let us use a simple example to demonstrate the relationship between risk and the proportion of the budget dedicated to aid. Suppose we have an institution with 100 students, none of whom are on aid. Suppose that the tuition rate is $200 and that tuition revenue is 50% of the total budget, $40,000. If enrollment declines by 10%, then only 90 students will be paying $200 and the college will get only $18,000 in tuition revenue. If we add that to the $20,000 in other income, the total budget is now $38,000 or 5% less than before the tuition increase. Thus, a 10% decline in tuition leads to a 5% decline in budget. The ratio of the change in available budget funds to the change in enrollment is the "budget sensitivity to enrollment decline ratio." This is a measure of risk. In this case the ratio is 0.5 (0.05 divided by 0.10). If the ratio is 1.0, then each percentage decline in enrollments is matched by the same percentage decline in budget. If the ratio is 1.5, then a 10% decline in enrollments causes a 15% decline in revenues.

With no financial aid in the budget, the budget sensitivity to enrollment decline is always the budget dependence on tuition revenue; this ratio never gets above 1.0. Tuition as a proportion of income does not exceed 100%, and the more tuition-dependent an institution is, the more sensitive its budget is to an enrollment decline.

Suppose, however, that 50 of our 100 students are on full scholarships, and our tuition is twice as high, or $400. After the scholarship discount is subtracted from the gross tuition calculation, our net revenue is still $40,000 ($20,000 net tuition and $20,000 other income), and we are still 50% tuition-dependent. Let us also suppose that we have a 10% enrollment decline *and that the ten students who leave are all full tuition payers*. Now net tuition revenue declines to $16,000:

100 students x 0.10 = 10
10 x $400 = $4,000 lost
$20,000 tuition – $4,000 = $16,000

Our total net revenues are $36,000 ($40,000–$4,000), and instead of a 5% decline, we have a 10% decline in resources to support our expense budget (excluding financial aid, which has been deducted from revenues). Therefore the budget sensitivity to enrollment decline ratio is 1.0, even without being 100% dependent on tuition. In other words, the impact of the enrollment decline worsened when the ratio of institutionally funded financial aid to the budget increased, under the condition when full-tuition payers differentially were part of the enrollment decline.

We can approach this same example in an industry-standard way, even though no other industry would call a revenue discount an expense. Gross tuition is $40,000 (100 x $400), giving us $60,000 in gross revenue (with $20,000 in other income). The expense side consists of $20,000 for scholarships and $40,000 for other expenses. If we lose ten full-paying students or 10% of the enrollment, our loss is $4,000, which will cause a 10% decline in the budget for other, non-scholarship, expenses (because we did not lose any students on scholarship and still must have $20,000 for them).

Budget Percentage Formulas

To develop formulas that describe this, let us begin with the situation where the only students who leave during an enrollment decline are those who are full tuition payers. Our beginning equation shows what happens to the budget when enrollment changes. The nomenclature used in the budget formula is:

Bud: net revenue budget (net of scholarships)
TRate: tuition rate
Enrol: enrollment
TRev: tuition revenue
TFA: total financial aid budget
$TRev_G$: gross tuition revenue (tuition before institutional grant aid is subtracted)
$TRev_N$: net tuition revenue (gross tuition less total institutional grant aid)

The subscripts 1 and 2 are used to designate the first and second year, respectively. For example, Bud_1 represents the net revenue budget for the current year and Bud_2 represents the net revenue budget for the next year. For purposes of this analysis we assume that the tuition rate (TRate) and total financial aid (TFA) budget do not change from year one to year two and the enrollments do change.

We know that next year's revenues will equal the current year's revenues plus the tuition rate times the change in enrollments, everything else, including other income, staying the same. If enrollments go down, then the budget will decline by the tuition for each student lost.

$$Bud_2 = Bud_1 + [TRate \times (Enrol_2 - Enrol_1)] \quad (1)$$

In our sample institution the budget in the second year will be equal to the first year's budget of $40,000 ($20,000 in other income plus 100 students times a tuition rate of $200) plus the tuition rate of $200 times the decline in enrollment (of five students), or $1,000. Thus, the new budget is $39,000, because the second year's enrollment is less than the first, making the second term negative.

We can subtract Bud_1 from both sides of equation (1) and then divide both sides of equation (1) by $(Enrol_2 - Enrol_1)$. Simplification then yields equation (2).

$$\frac{Bud_2 - Bud_1}{Enrol_2 - Enrol_1} = TRate \quad (2)$$

Although this equation has little intrinsic meaning, it is valid for our assumptions. The budget difference (–$1,000) divided by the enrollment difference (–5 students) is indeed the tuition rate of $200 per student. Using the identity: $(Enrol_1/Bud_1) = (1/Bud_1) / (1/Enrol_1)$ we can multiply the right-hand side of equation (2) by $(1/Bud_1) / (1/Enrol_1)$ and the left-hand side of equation (2) by $(Enrol_1/Bud_1)$ and simplify to obtain equation (3):

$$\frac{\dfrac{Bud_2 - Bud_1}{Bud_1}}{\dfrac{Enrol_2 - Enrol_1}{Enrol_1}} = \frac{TRate \times Enrol_1}{Bud_1} \quad (3)$$

In the example, the change measure of the budget is –$1,000 over $40,000, or – 0.025 (–2.5%). The enrollment change measure is –5 over 100 or –0.05 (–5.0%). The ratio of these two numbers is 0.5

(–0.025 divided by –0.05 equals 0.5) and is the value in this example for the left side of equation (3). On the right side, the tuition rate of $200 times the original enrollment of 100 divided by the original budget of $40,000 yields, as it should, the same number, 0.5.

The left side of equation (3) is now the sensitivity of the budget to an enrollment change. It takes the form of the ratio of the two change measures (budget change over enrollment change), where a change measure is the second year less the first year divided by the first year. Using enrollment as an example, a decrease from 100 to 95 students (–5 students) gives a change measure of (95 – 100) divided by 100, or –0.05, the equivalent to –5%. This ratio of the two change measures, budget change (BC) to enrollment change (EC), will be designated as BC/EC.

If there was no financial aid at this institution, then we could substitute total tuition revenue for TRate **x** Enrol_1. We would then have:

$$\text{BC/EC} = \text{total tuition revenue/budget} = \text{TRev}_G / \text{Bud}_1 \quad (4)$$

As we predicted, the sensitivity of the budget to enrollment change equals the proportion of the budget funded by tuition when no financial aid is budgeted at the institution.

Tuition revenue in this case is gross tuition revenue. If we rewrite the equation in terms of net tuition revenue, then we can see the impact of financial aid. In equation (5), net tuition revenue is defined as gross tuition revenue less total student aid.

$$\text{TRev}_N = \text{TRev}_G - \text{TFA} \quad (5)$$

making

$$\text{TRev}_G = \text{TRev}_N + \text{TFA} \quad (6)$$

We can substitute equation (6) into the budget sensitivity equation (4) and arrive at equation (7).

$$\text{BC/EC} = \text{TRev}_G / \text{Bud}_1 = (\text{TRev}_N / \text{Bud}_1) + (\text{TFA} / \text{Bud}_1) \quad (7)$$

The second example used above included the same number of students, with half paying a tuition of $400 and the other half with full scholarships. As such, the original (true expense) budget remains at $40,000 and net tuition revenue stays at $20,000. *Gross* tuition revenue, however, is $40,000, while the total financial aid budget (TFA) must be $20,000. Therefore, to find the sensitivity of a budget decline to an enrollment decline, *assuming all the decline occurs among full tuition payers,* equation (7) must be solved. Net tuition revenue over the original budget is $20,000 divided by $40,000, or 0.5. The ratio of the total aid budget, $20,000, to the original budget is 0.5, and the sum of these, 1.0, is the new, higher response level of the budget to an enrollment decline.

This indicates that in situations where all of the decline in enrollment consists of full-paying students (which must be the case for this equation because we multiplied the enrollment decline times the *full* tuition rate), the sensitivity of the budget to declining enrollment is the budget proportion supported by tuition plus the proportion of revenues used for financial aid. Note that the tuition dependence ratio is measured using net, or true, tuition revenue—aid has been subtracted out.

We can rearrange the terms in equation (7) and make the financial aid proportion the dependent variable. In this case we get:

$$\text{TFA/Bud}_1 = (\text{BC/EC}) - (\text{TRev}_N / \text{Bud}_1) \quad (8)$$

Just to demonstrate that equation (8) still balances after its transformation from equation (7), the proportion of financial aid out of the original expense budget for the example is 0.5, which does equal the budget sensitivity to an enrollment decline of 1.0 less the net tuition revenue to budget ratio of 0.5.

The analyst can thus calculate a desirable financial aid to budget ratio. Suppose that our institution is 60% dependent on tuition (net), and the analyst wants to hold the institution's budget response to an enrollment decline below 70%. The analyst wants the institution's budget to decline by less than 7% when enrollment falls 10%. In this case, using equation (8), the institution's financial aid ratio should be 10% or less (70% – 60% = 10%).

Institutions of higher education have done very little systematic thinking on risks. One of the major themes of this chapter is that administrators can make decisions about the level of risk that they face. The 70% used here is arbitrary, and some consideration of the risk exposure of the institution is required to undertake this analysis.

Note that this financial aid ratio is probably not quite what all administrators have had in mind when they have attempted to define financial aid limits. The more familiar ratio would be TFA / (Bud_1+TFA), giving the ratio of financial aid out of the total budget. However, Bud_1 is revenue net of scholarship discounts available for non-scholarship expenses. The change in that number represents the change in funds available for the non-scholarship expense budget as a whole.

The example in which some proportion of the enrollment decline is taken up by those who are aided is more complex. First, let a be the proportion of the enrollment decline taken up by those receiving a typical aid package (this analysis assumes that all aided students have the same average institutional grant package). Then, if we let AS stand for the number of aided students, the impact of the loss of one of these students is TRate – TFA/AS, or the tuition rate minus the financial aid budget apportioned over all institutional grant aid recipients—tuition less the average award.

Thus, the second year's budget equals the first year's budget plus the proportion of the enrollment decline allocated to full-payers times the full tuition rate plus the proportion of the enrollment decline allocated to aided students times the tuition rate less the average amount of aid per student.

$$Bud_2 = Bud_1 + \left(\{[1-a] \times [Enrol_2 - Enrol_1) \times [TRate]\} + \{[a] \times [Enrol_2 - Enrol_1] \times [TRate - (TFA/AS)]\}\right) \quad (9)$$

To clarify this, two additional assumptions are added to the example above: that 60% of all students are on financial aid; and that when an enrollment decline occurs, 20% of the "lost" students are scholarship recipients. For the equations, this means that AS = 120 (60% x 200) and that a is 0.2. Therefore, the second year's budget becomes the sum of three things: (1) the original budget of $40,000; (2) the tuition difference from a change in full-payers, or $1 - a$ (80%) multiplied by the enrollment decline of 5 students (netting *minus* 4 students) and by the tuition rate ($200), or –$800; and (3) the tuition difference from a change in scholarship students or a (20%) multiplied by their enrollment change, netting *minus* one student, and by the tuition rate actually paid by scholarship students, $200 less the average award of $167 ($20,000 divided by 120) for a net of $33 or a total impact of *minus* $33. The sum of the three terms is $39,167. This is a less harsh reaction to the enrollment decline than the $39,000 when *only* full tuition payers leave during an enrollment decline.

Solving, as we did above for BC/EC and rearranging for clarity, we get:

$$BC/EC = [TRev_s / Bud_1] + [TFA/ Bud_1] \times [1 - a \times (Enrol_1 / AS)] \quad (10)$$

Thus, in the example, the budget sensitivity to an enrollment change is the net tuition revenue proportion of the budget, 0.5, plus the total financial aid budget proportion of the total budget, 0.5, after it

is multiplied by a complex term that includes the inverse of the proportion of aided students (1/0.60), or 1.67, and the proportion of "lost" students who are scholarship recipients, or 0.2. The full calculation from equation (10) is:

$$0.5 + \{[0.5] \mathbf{x} [1 - (0.2 \times 1.67)]\} = 0.83$$

which is less than the 1.0 that results when *only* full tuition payers leave during a enrollment decline.

Thus, if a is zero, and all the enrollment decline is taken by full tuition payers, then we have equation (7). If some portion of the decline occurs among aided students, however, then the effect of the financial aid ratio of the budget on the sensitivity of budget change to enrollment decline is reduced. The last term in equation (10) indicates that the budget decline sensitivity to enrollment decline is also either positively or negatively dependent on the ratio of financial aid to the real budget, depending on the proportion of the enrollment decline taken up by scholarship students and their proportion within enrollment.

Using this equation we may say that there are three kinds of tuition payers: those who pay the average rate (net tuition revenue divided by the number of students), those who get a discount off the average, and those who pay above the average. "Full-payers" fall into the latter group of premium-paying students.

The formula can thus be used to show that when the institution loses financial aid students in the same proportion as their representation on campus ($a = AS/Enrol_1$), the sensitivity of a budget decline to an enrollment decline is only driven by net tuition revenue dependence. This can be generalized for any group of students. When enrollment decline for the group is in proportion to their representation on campus, net tuition revenue dependence is the major source of concern.

When $a = AS/Enrol_1$, then $[1 - a \mathbf{x} (Enrol_1/AS)]$ equals zero and the right side of the equation simply becomes $(TRev_N/Bud)$.

When $(a \mathbf{x} Enrol_1/AS)$ is less than one, then the loss of students during an enrollment decline must be among premium-paying students. The sensitivity of the budget decline to an enrollment decline is heightened by the loss of the premium they were paying. This is reflected in equation (10) in the term

$$+ (TFA/Bud_1) \mathbf{x} [1 - a \mathbf{x} (Enrol_1/AS)]$$

which has increasingly positive values as the expression $[a \mathbf{x} (Enrol_1/AS)]$ approaches zero, or as all enrollment losses are among the highest premium-paying group.

All losses could also be among the lowest-paying group on campus. Then $[a \mathbf{x} (Enrol_1/AS)]$ would be greater than one. Here a higher financial aid budget proportion would dampen the impact of enrollment losses on the budget.

To find a formula for the financial aid ratio, we can solve equation (10) for TFA/Bud_1.

$$TFA/Bud_1 = \frac{BC/EC - TRev_N/Bud_1}{1 - a \mathbf{x} (Enrol_1/AS)} \qquad (11)$$

Thus, in this same example, if we wanted to reduce the budget sensitivity to an enrollment decline to 0.7, we could solve equation (11). The arithmetic for this comes from the work done on equation (10) and is simply $\{(0.7 - 0.5) / [1 - (0.2 \times 1.67)]\}$, or 0.3. This reduction to 30% would be a major decline from the current student aid budget proportion of 50%.

Once again, if a, the proportion of enrollment decline attributable to aided students, is zero, that is, only full-payers are lost, then we have the same result as equation (8). Now, however, we have a complex

modifying term. As the proportion of enrollment loss taken up by aided students increases, the financial aid ratio can be increased for given levels of "budget sensitivity to enrollment decline" and given levels of tuition dependence. As the proportion of aided students participating in an enrollment decline approaches the level of their proportion in the overall enrollment, the financial aid ratio becomes less of a problem lever when a decline in enrollment comes.

Also, the higher the proportion of aided students in the total enrollment, the lower the financial aid ratio must be to maintain given levels of budget sensitivity to enrollment declines. The lever is increased. Every loss of a full tuition payer is felt more gravely. Note too that when the proportion of aided students participating in an enrollment decline equals the proportion of enrollment decline by all students, the equation blows up. In other words, the less an enrollment decline differentiates between full-payers and aided students, the less we can say about the proportion which financial aid should be of the full budget. If full-paying burden is an irrelevant factor in enrollment declines, then our level of budget risk does not depend on the budget proportion of the financial aid budget.

As an example, suppose we still have an institution that wants its budget sensitivity to enrollment decline to be about 70%. That is to say, it wants its budget to decline by 7% or less when enrollments fall 10%. Let us suppose once again that this institution is 60% net tuition dependent. Remember that in this instance the financial aid ratio would have to be less than 10%, if the enrollment decline is made up of tuition payers only. This time, let us use our new equation to factor in that the enrollment decline is split 80% to tuition payers and 20% to typical aided students ($a = 0.2$). Let us also assume that 60% of the student body is on financial aid.

Now we can see that 15% of the net budget should be dedicated to institutionally-funded financial aid for the institution to achieve its budget sensitivity goals [(70% – 60%) / [1– (20% / 60%)]. We can be more lenient with this ratio if not all the enrollment decline occurs among full-tuition payers. The key assumption behind these calculations is that full-payers, especially full-payers with only loan support, are more likely to decide to go to a less expensive institution when tuition rates are raised. The extent to which this assumption is true underlies the importance of the financial aid ratio as a determinant of budget sensitivity to enrollment decline.

Many of the terms of these equations are easily available from institutional financial and financial aid data. What most institutions do not know is the proportion of an enrollment decline that might be taken up by full tuition payers. This is exceedingly hard information to develop because the fall-off could be a combined retention and recruitment problem. Institutions can look for those years when expectations for new students were not met and ask: Was the ratio of aided to non-aided students different in those years than in more successful years? Based on that information, can the average decline be split between aided and non-aided? The same might be done with retention figures. A weighted average of the two results could be used to produce the a coefficient.

Action Research

The combination of these three separate research focuses produces information for decisions and policies in a very dynamic sense, and the results are only poorly adapted to traditional research paper investigations. A final example will tie the research efforts to a policy result.

The analyst begins by involving the Financial Aid Policy Committee, the Affirmative Action Committee and finally the College Policy Council in a discussion of diversity goals. The result is a goal to increase the number of students of color from 5% to 10% of enrollments. The analyst finds that one segment of this effort would require the increase of targeted scholarship funds for students of color by $1 million. There is some evidence that $200,000 in scholarship funds is required to support each 1% increase in enrollments for this group (although not all of the new students from this group require aid, nor is aid the only effort required to change the enrollment structure).

Turning to the second goal, raising the scholarship funds, the analyst finds that a 3% increase in tuition would directly pay for the $1 million in aid. Unfortunately, based on the rough elasticity graph that the analyst is able to put together, a 3% increase in tuition would result in a general decline in enrollments and an increase in need for all students. Nevertheless, the analyst can show that a 5% increase in tuition would pay for the small decline in enrollments and the increase in necessary financial aid for all students.

The analyst is less certain about the safety of this strategy in attempting to achieve the third goal, financial stability. The elasticity graph is based on historical information with many changes in demographics and college attendance rates. As a result, the institution could be close to severe problems with enrollments with a tuition increase that large. In fact, one competitor suffered a rather large decline in enrollments last year with a moderate increase in tuition and rumors of cuts in faculty and staff. The analyst then tests for budget sensitivity to enrollment declines with equation (10), using known data including the size of the average aid award, the number of aided students, and the proportion of the budget supported by tuition.

The result of this third analysis shows that the budget would decline by 15% if total enrollments fell by only 10%. If this level of risk seems unacceptable, the analyst goes back to the first goal to see if phasing in the enrollment proportion shift for students of color over three years could provide more safety at less cost.

This example shows how the interplay between the conceptual frameworks, each an outgrowth of attempting to understand a particular financial aid policy goal, leads to increasingly sophisticated, but often very broad, kinds of research that can directly affect financial aid policy decisions.

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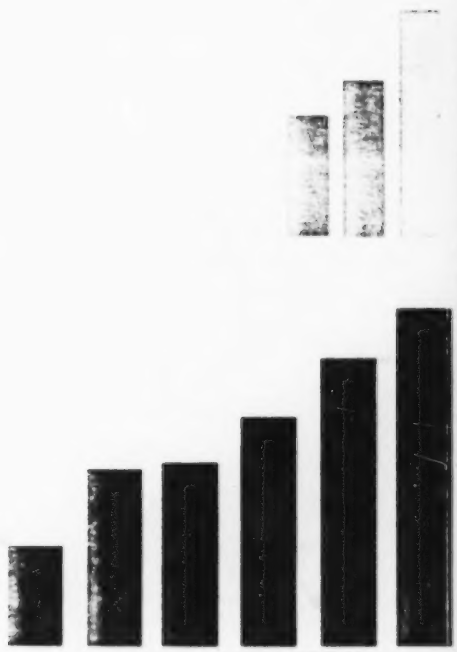

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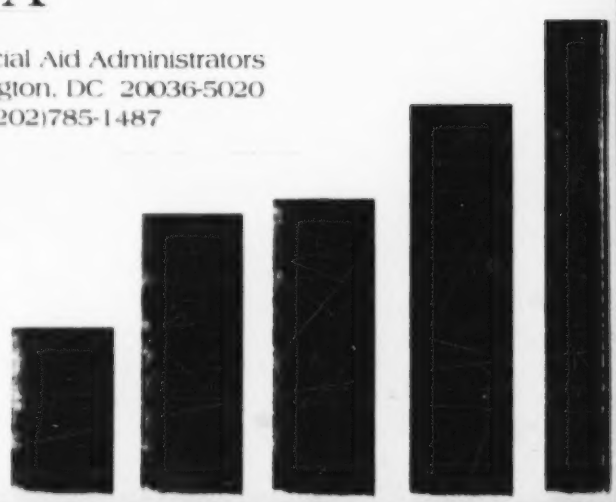

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